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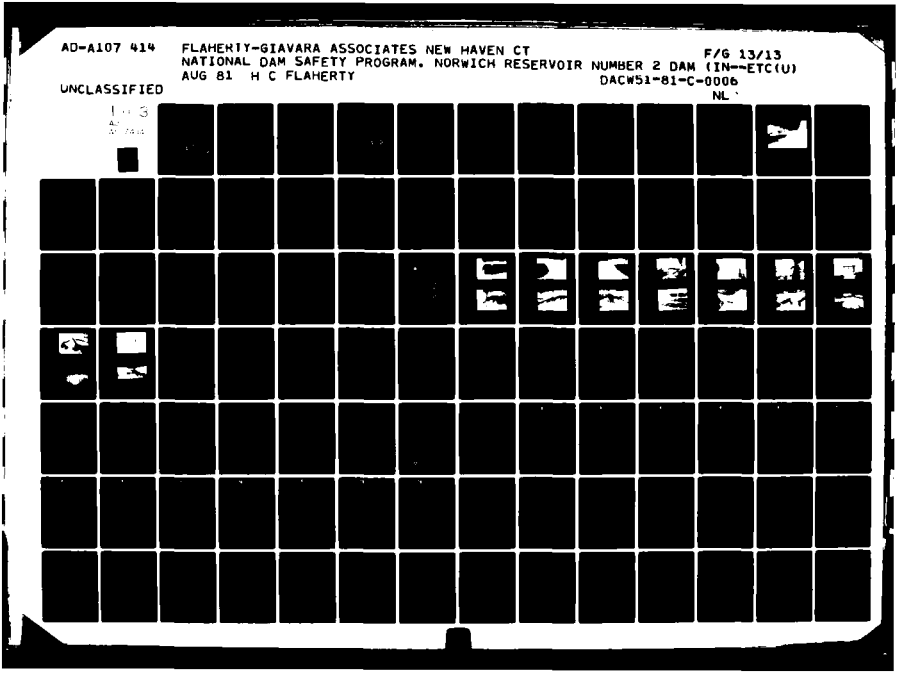

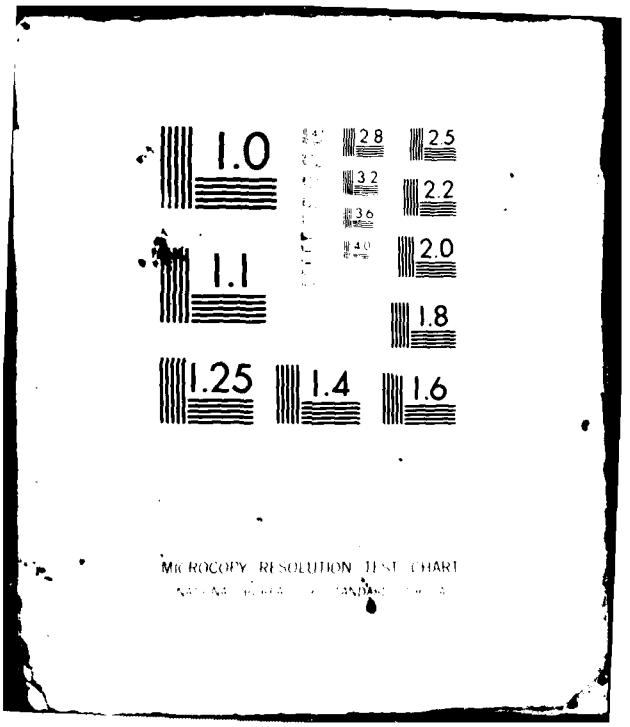
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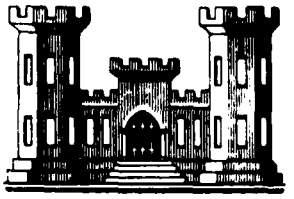
SUSQUEHANNA RIVER BASIN

LEVEL I

NORWICH RESERVOIR NO. 2 DAM

CHENANGO COUNTY, NEW YORK
INVENTORY No. NY 349

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



NEW YORK DISTRICT, CORPS OF ENGINEERS
MAY 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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4. TITLE (and Subtitle) Phase I Inspection Report Norwich Reservoir No. 2 Dam Sqsquehanna River Basin, Chenango County, N.Y. Inventory No. 349	5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program / 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) HUGH C. FLAHERTY	8. CONTRACT OR GRANT NUMBER(s) DACW51-81-C-0006
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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

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18. SUPPLEMENTARY NOTES

National Dam Safety Program. Norwich Reservoir Number 2 Dam (Inventory Number NY 349), Susquehanna River Basin, Chenango County, New York. Phase I Inspection Report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Norwich Reservoir No. 2 Dam
Chenango County
Susquehanna River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Examination of available documents and a visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies that need to be evaluated and remedied.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Using the Corps of Engineers' Screening Criteria for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped by the outflow resulting from all storms exceeding 13 percent of the Probable Maximum Flood (PMF). Dam overtopping, the resulting erosion of the embankment and hence, dam breaching would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, nonemergency.

The classification "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to life downstream from the dam.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NORWICH RESERVOIR NO. 2 DAM
INVENTORY NO. NY 349
SUSQUEHANNA RIVER BASIN
CHENANGO COUNTY, NEW YORK

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Norwich Reservoir No. 2 Dam

State Located: New York

County: Chenango

Watershed: Susquehanna River Basin

Stream: Ransford Creek

Date of Inspection: March 13, 1981

ASSESSMENT

Examination of available documents and a visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies that need to be evaluated and remedied.

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped by the outflow resulting from all storms exceeding 13 percent of the Probable Maximum Flood (PMF). Dam overtopping, the resulting erosion of the embankment and hence, dam breaching would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, nonemergency.

The classification "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to life downstream from the dam.

It is recommended that the following additional investigations be performed by a registered professional engineer engaged by the owner:

1. Conduct a detailed hydrologic and hydraulic analysis to determine the need for and methods of increasing the discharge capacity of the dam. This would include investigating the adequacy of the principal spillway weir and discharge channel (bypass canal) and the emergency spillway.

2. Verify the location, methods of construction and if possible, the condition of the outlet modifications (where the 36 inch former principal spillway was cut off and flow was diverted to the twin 12 inch pipes leading to the lower reservoir).

It is recommended that within 3 months of the final approval date of this report, the hydrologic investigation of the structure should be undertaken and within 6 months, the remaining investigation should commence. Appropriate remedial measures for both additional investigations should be completed within 18 months of the final approval.

The following remedial measures should be completed within 12 months to correct existing deficiencies:

1. Remove all spruce trees that are growing between the crest and lower berm on the left side of the downstream embankment slope and also any whose trunks or roots may be encroaching onto the right side of the embankment. The trees growing on the abutments may remain. The trees to be removed constitute a potential hazard if uprooted during a storm. This may lead to a loss of freeboard, to a dangerous reduction of embankment width, or to the formation of piping channels if uprooted and the remaining roots rot in place.

2. The trunks of all cut trees are to be removed and backfilled. Equipment and procedures for this maintenance operation should be such as to avoid damage to existing grass and weed cover on the slopes. Any slopes that become scarred by runoff or traffic should be reseeded and mulched.

3. Patch the cracks in the concrete apron and repair the separation between the concrete headwall and apron of the emergency spillway inlet to prevent water from flowing up from beneath the apron.

4. Place rockfill in the bypass canal below the outlet headwall of the emergency spillway where undermining has begun.

5. Ensure the reservoir drain and its controls are operational.

6. Backfill and regrade the areas of minor surface sloughs on the downstream slope.

7. Regrade the dam crest to remove vehicle ruts and shallow depressions and allow surface runoff without concentrated flow. A gravel surface layer would improve trafficability and reduce rutting.

8. Continue to periodically cut the brush on the slopes of the embankment and the bypass canal bottom to prevent their being overgrown.

9. Fill in the animal burrows noted on the embankment slopes.

10. Develop and implement a flood warning and emergency evacuation plan to alert the downstream residents in the event conditions occur which could result in failure of the dam.

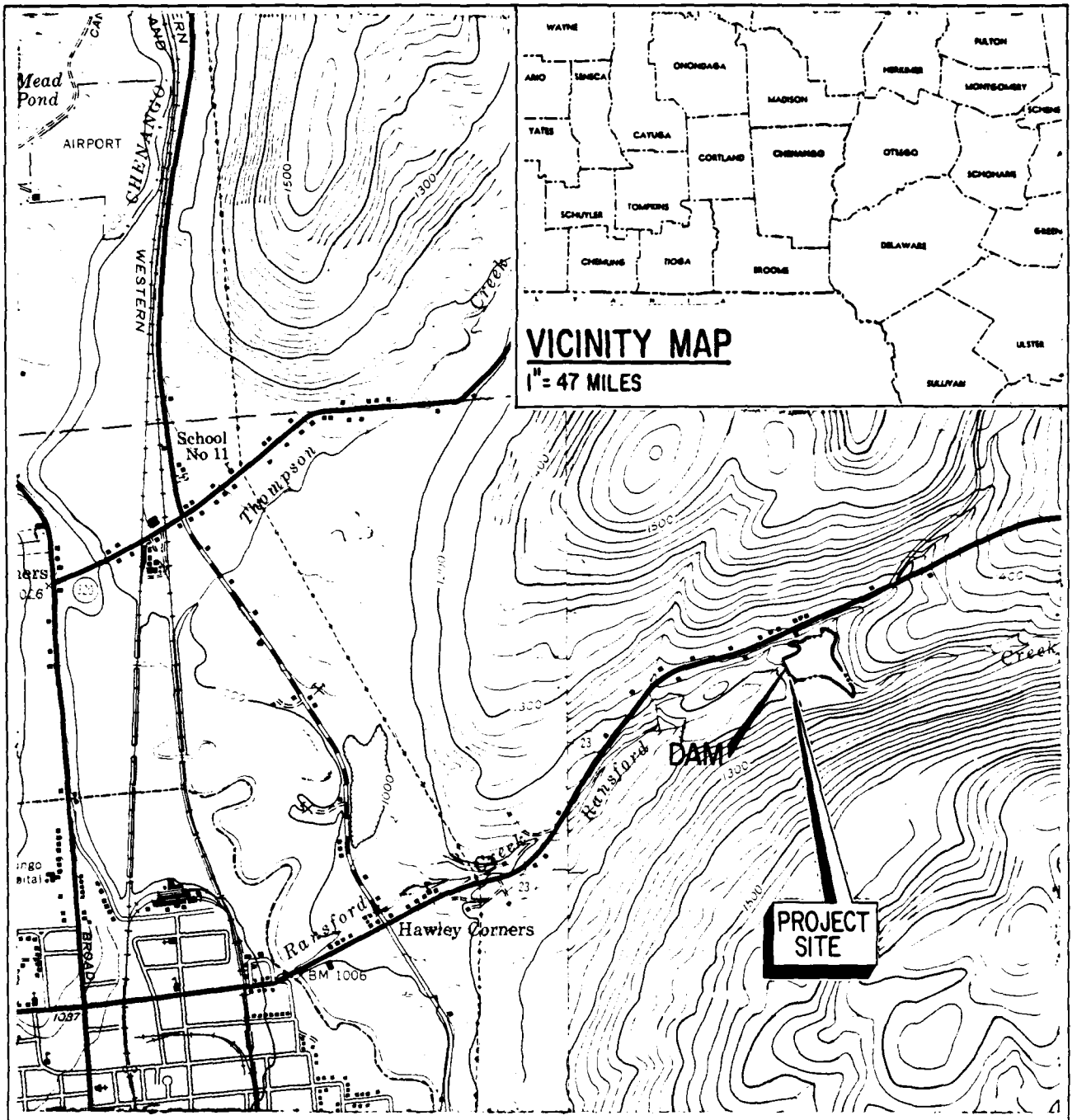
Submitted by: FLAHERTY GIAVARA ASSOCIATES, P.C.

Hugh C. Flaherty, P.E. & L.S.
Chairman of the Board
New York License No. 58508

Approved by: Col. W. M. Smith, Jr.
New York District Engineer

Date: 3 Aug 81

PHOTO #1: Overview of
Norwich Reservoir No. 2 Dam
Inventory No. NY 349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CHENANGO
WESTERN
School No 11
Thompson
Creek
Ransford
DAM
Hawley Corners
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WAYNE
ONONDAGA
MADISON
CAYUGA
CORTLAND
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TOMPKINS
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VICINITY MAP
1" = 47 MILES
LOCATION MAP
NORWICH RESERVOIR No. 2 DAM
INVENTORY No. NY 349
SUSQUEHANNA RIVER BASIN
CHENANGO COUNTY
NORWICH, NEW YORK
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NATIONAL DAM SAFETY PROGRAM
PHASE I INSPECTION REPORT
NORWICH RESERVOIR NO. 2 DAM
INVENTORY NO. NY 349
D.E.C. NO. 117C-621
SUSQUEHANNA RIVER BASIN
CHENANGO COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367. Flaherty Giavara Associates, P.C. has been retained by the New York District to inspect and report on selected dams in the State of New York. Authorization and notice to proceed was issued to Flaherty Giavara Associates, P.C. under a letter of December 24, 1980 from W. M. Smith, Jr. Colonel, Corps of Engineers. Contract No. DACW 51-81-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

Evaluation of the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Norwich Reservoir No. 2 Dam consists of an earthen embankment with a 36 inch diameter cast iron water supply pipe under the right central portion of the embankment, a cut stone masonry and concrete principal spillway with flashboards and a "bypass canal" beyond the right abutment and an emergency spillway utilizing twin 48 inch diameter corrugated metal pipes through the right abutment. Profiles and sections prepared for the project by the Norwich Water Works are included on drawings in Appendix F.

The dam embankment is 638 feet long and a maximum of 56 feet high and has an upstream slope of 3 horizontal to 1 vertical and a downstream slope of 2 to 1. The crest of

the dam is 10 feet in width and its elevation is 1249.0 (NGVD). There is a 15 to 18 foot berm near the downstream toe of slope. The embankment cross section consists primarily of compacted glacial material except for a 10± foot wide zone of compacted clay and gravel (puddled) core. The core is 5 feet wide near the top of the embankment and widens to 9 to 14 feet at the original ground surface. The core extends 7 to 18 feet below ground surface to form a cutoff. The width of the bottom of the cutoff is approximately 5 to 6 feet.

The upstream slope has a layer of 15 inches of broken rock for slope protection, while the downstream slope has a "soil dressing" and grass.

A 36 inch diameter cast iron water supply pipe runs beneath the right central part of the embankment from an intake structure in the reservoir, and constitutes part of the water supply system for the City of Norwich.

The principal spillway is 45 feet wide consisting of a cut stone masonry and concrete weir with wooden flashboards, cut stone masonry abutments and wingwalls and a 2400 foot long "bypass canal". It is located to the north of the right abutment diverting flow around both this dam and Norwich Water Works Dam No. 1 (NY 347). The "bypass canal" is excavated into earth and rock while portions of the left side are formed by a berm. The excavated side slopes vary; however, the berm side slopes are 2 horizontal to 1 vertical on the canal side and 2.5 to 1 on the side sloping away from the canal.

The emergency spillway consists of two 48 inch diameter corrugated metal pipes located between the reservoir and the bypass canal and discharging a short distance downstream of the principal spillway weir. At the inlet, there is a concrete headwall and a concrete apron which serves as a weir, and at the outlet into the bypass canal there is a concrete endwall.

b. Location

The Norwich Reservoir No. 2 Dam is located off New York Route 23 approximately 1.6 miles northeast of the City of Norwich in the Town of Norwich, New York. The dam is located at latitude north 42°-33.0' and longitude west 75°-29.3' on the U.S. Geological Survey 7.5 minute series topographic map "Holmesville, New York". The Location Map on page i indicates where the dam is situated.

c. Size Classification

The maximum height of the dam is 56 feet and the maximum storage capacity is 222 acre-feet. Therefore, Norwich Reservoir No. 2 Dam is classified as an "Intermediate" dam as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

There are approximately 2 dwellings, a large trailer park (30 to 40 trailers), 4 commercial buildings, two major roads (including New York Route 23) and high voltage transmission lines within the dam failure flood hazard area. Therefore, the dam is in the "High" hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the City of Norwich. The address and telephone number of the owner is as follows:

Owner

Contact: Mr. Nicholas W. Andrews, Superintendent
Norwich Water Department
City of Norwich
31 East Main Street
Norwich, New York 13815

Telephone: (607) 334-6618

f. Purpose

The primary purpose of this dam is water supply for the City of Norwich.

g. Design and Construction History

The dam was designed in 1888 by the Norwich Water Works, W. S. Franklin, Chief Engineer and John Mitchell, President. It was constructed in 1890 by the Troy Public Works Company-Limited of Troy, New York. Major post construction modifications include the installation of flashboards on the principal spillway weir in 1913 and the construction of the emergency spillway in 1967.

h. Normal Operating Procedure

The water level in the reservoir is checked visually twice daily, seven days a week. The flashboards are lowered in late spring to retain flow during the dry months,

then they are raised in late fall to permit flow to pass during the wet months.

1.3 PERTINENT DATA

a. Drainage Area (Square Miles)	3.79
b. Discharge at Dam Site (CFS)	
- Top of Dam	934
- Crest of Emergency Spillway	95
- Crest of Principal Spillway	
left weir (with flashboards)	69
right weir (without flashboards)	-
c. Elevations	
- Top of Dam	1249.0
- Crest of Emergency Spillway	1245.6
- Crest of Principal Spillway	
left weir (with flashboards)	1245.4
right weir (without flashboards)	1244.1
- Reservoir Drain Inlet	1205.0
d. Reservoir Surface Area (Acres)	
- Top of Dam	12.0
- Crest of Emergency Spillway	10.0
- Crest of Principal Spillway	
left weir (with flashboards)	9.9
right weir (without flashboards)	9.1
e. Storage (Acre-Feet)	
- Top of Dam	222
- Crest of Emergency Spillway	189
- Crest of Principal Spillway	
left weir (with flashboards)	187
right weir (without flashboards)	176
f. Dam	
- Type: Compacted glacial material with a compacted clay and gravel (puddled) core and cutoff	
- Length (Feet)	638
- Upstream Slope (H:V)	3:1
- Downstream Slope (H:V)	2:1
- Crest Width (Feet)	10

g. Principal Spillway

- Type: Cut stone masonry weir with a concrete crest and adjustable flashboards as well as an excavated earthen channel (bypass canal)
- Length (Feet)

weir	42
channel	2400

- Bottom Width (Feet)

weir	30
channel	45

- Side Slopes (H:V)

weir	vertical
channel	0.5-2.0:1

- Channel Bottom Slopes (Feet/Foot)

upstream	-
downstream	0.004 to 0.060

- Control: Flashboards

h. Emergency Spillway

- Type: Twin 48 inch diameter corrugated metal pipes (112 feet long) with a concrete apron and headwall at its inlet and a concrete endwall at its outlet

- Control: None

i. Reservoir Drain

- Type: 36 inch diameter cast iron pipe (200 feet long)

- Control: 36 inch diameter slide gate located near the outlet into the stilling basin

SECTION 2 - ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

The Norwich Reservoir No. 2 Dam is located on Ransford Creek, a southwesterly flowing tributary to the Chenango River, about 1.5 miles northeast of the City of Norwich in the Appalachian (Allegheny) Plateau physiographic province of New York State.

The topography in the area ranges from elevation 1200 at the streambed downstream of the dam to about elevation 1500 to 1780 at the summits of hills surrounding the dam and reservoir area.

The underlying bedrock at the site consists of the Unadilla Formation belonging to the Upper Devonian Genesee group. This formation consists of coarse silty shales and siltstones that were deposited in a shallow water, near-shore setting of the Catskill Delta that propagated across the state from east to west. The bedding of these deposits is quite even and laminated, splitting readily into thin sheets upon exposure.

Above the bedrock, the valley bottom and side slopes are mantled by a heterogeneous mixture of clay, silt, sand and rock fragments known as glacial till (or hardpan).

b. Subsurface Investigations

No known subsurface explorations were made at the site. Based on reports made in the mid 1920's, the subsurface conditions at the site consist of relatively impermeable glacial till (hardpan) or shale bedrock.

2.2 DESIGN RECORDS

The Norwich Reservoir No. 2 Dam was designed in 1888 by the Norwich Water Works, W. S. Franklin, Chief Engineer. No design data was obtained for this dam.

2.3 CONSTRUCTION RECORDS

This dam was constructed in 1890 by the Troy Public Works Company-Limited of Troy, New York. Cross sections and a profile of the embankment and bypass canal, a plan and profile of the waste weir and plans for the installation of the flashboards are included in Appendix F. In addition, excerpts from the technical specifications can be found in Appendix D.

2.4 OPERATION RECORDS

There were no operation records available for this dam.

2.5 EVALUATION OF DATA

The data presented herein was obtained primarily from the Norwich Water Department located in Norwich, New York and also from the files of the New York State Department of Environmental Conservation (DEC). This information appears to be reliable and adequate for the purposes of a Phase I Inspection Report.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the Norwich Reservoir No. 2 Dam was conducted on March 13, 1981. The weather was overcast and the temperature was 40±°F. At the time of the inspection, there were small patches of snow on the ground and water was flowing in the principal spillway (See Photo No. 9).

b. Dam

The earthfill embankment of the dam is generally in good condition (See Photos No. 4, 5, 6 and 7). The dam crest is also in good condition except for vehicle ruts and shallow depressions and is presently used for access to Norwich Water Works Dam No. 1 (See Photo No. 3). There was no visible evidence of lateral movement, seepage, major settlement or erosion, or other serious defects.

The following specific items were noted:

1. Several minor surface sloughs were observed on the right side of the upper downstream slope.

2. Several large animal burrows were noted on the upper portion of the downstream slope. Several small animal burrows were observed near the crest on both the upstream and downstream slopes (See Photo No. 18).

3. Moderate to large-sized spruce trees are growing on the downstream slope along the left and right abutments; this tree cover overlaps onto the downstream embankment slope on the left side (See Photos No. 5 and 7).

c. Principal Spillway

1. Principal Spillway Weir

This two-stage broad-crested weir is constructed of cut stone masonry and concrete and is in good condition. The lower stage contains provisions for 2.5 foot high adjustable flashboards. The approach channel to the weir is straight, free from debris and also in good condition (See Photo No. 8). A 50 foot long by 13 foot wide bridge spans the spillway weir (See Photo No. 8) and is used for access to the lower reservoir, dam and chemical feed building. It has two spans constructed of steel I-beams, a steel grate

deck and a 3 foot high pipe rail parapet (See Photo No. 8).

2. Principal Spillway Discharge Channel (Bypass Canal)

The discharge channel has a typical width of 45 feet, a length of approximately 2400 feet and is in good condition (See Photo No. 12). This channel directs flow around both this dam and the lower dam (NY 347). The side slopes of the channel vary from 0.5 horizontal to 1 vertical to 2:1 and are excavated into bedrock in some sections. Portions of the left side slope are formed by an earthen berm.

d. Emergency Spillway

The twin 48 inch diameter corrugated metal pipes which discharge into the bypass canal are in good condition showing little sign of deterioration.

The following observations were made:

1. Numerous cracks were observed in the concrete walls and apron of the inlet structure (See Photo No. 10). These cracks range from hairline to 1/4 inch in width and at one location as indicated on the sketch on page B-11 in Appendix B, there is a 3/8 inch separation between the abutment and wingwall. Water seepage was noted between the concrete apron and the headwall at the inlet (See Photo No. 11). The pipe inlet elevation was approximately 0.3 feet below the reservoir level at the time of observation.

2. Slight undermining of the concrete endwall was noted at the emergency spillway outlet into the bypass canal (See Photos No. 12 and 13). No flow beneath the headwall was observed.

3. The left 48 inch CMP has an angle point in its horizontal alignment.

e. Water Distribution System Appurtenances

1. Intake Structure

A wood and stone masonry intake structure is located approximately 100 feet from the dam crest within the reservoir (See Photo No. 14). It is connected to the shoreline by a 58 foot long by 5 foot wide access footbridge. Both structures are in good condition showing little sign of deterioration.

2. Outlet Works

The primary outlet works is a 36 inch diameter cast iron water supply pipe located between the intake structure and the stilling basin (See No. Photo 15). Connected to this pipe is a 12 inch diameter cast iron pipe which supplies water to two 4 inch diameter cast iron discharge pipes (See Photo No. 16), to the aerating jets of the lower reservoir and to the City of Norwich water distribution system. Additionally, a 14 inch diameter cast iron pipe serves as a drain for the stilling basin emptying into the lower reservoir (See Photo No. 17). The pipe networks for the upper and lower reservoirs are shown on a "Sketch Map" on page D-17 in Appendix D.

f. Downstream Channel

The only natural channel downstream of the dam is located at the end of the bypass canal below the lower dam and reservoir. It has a width of 10 to 15 feet and a depth of 6 inches. Immediately downstream of the upper dam is the lower reservoir and dam - NY 347 (See Photo No. 19).

g. Reservoir - Storage Pool Area

The reservoir area is bordered by moderately to steeply sloping wooded land. There does not appear to be any significant probability of landslides into the storage pool affecting the safety of the dam (See Photo No. 2).

The "bypass canal" for Reservoir No. 2 runs along the top of the slope above the right side of Reservoir No. 1. An earthen berm was built along portions of the bypass canal on the side adjacent to Reservoir No. 1, but well back from the top of slope.

3.2 EVALUATION OF OBSERVATIONS

The visual inspection revealed several deficiencies. The following observations were made:

a. Moderate to large-sized spruce trees were growing on the left downstream slope and along each abutment.

b. Numerous cracks were noted in the concrete walls and apron of the emergency spillway inlet structure.

c. Slight undermining of the concrete endwall was observed at the outlet to the emergency spillway.

d. Several minor surface sloughs were observed on the right side of the upper downstream slope.

e. Vehicle ruts and shallow depressions were noted on the dam crest.

f. Several large animal burrows were noted on the upper portion of the downstream slope.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal water surface level is maintained by the crest of the right broad-crested weir of the principal spillway at elevation 1244.1 (NGVD). However, with the flashboards in place, the normal water surface level is increased to the elevation of the left broad-crested weir at 1245.4 (NGVD). The following operational procedures are in effect at this time:

a. The reservoir water level is checked visually twice daily, seven days a week.

b. The reservoir level can be raised by diverting water via a tunnel to Ransford Creek from Chenango Lake in the Unadilla River watershed.

4.2 MAINTENANCE OF DAM

Maintenance operations at the Norwich Reservoir No. 2 Dam include:

a. The dam crest and embankments are mowed manually once every year.

b. Deciduous trees are cut back annually to prevent them from growing too close to the reservoir.

c. Repairs to masonry are performed as required.

d. Metalwork and wooden structures are painted as necessary.

4.3 WARNING SYSTEM

No warning system is presently in effect.

4.4 EVALUATION

Presently, the operation and maintenance procedures in effect for this dam and its appurtenances are satisfactory. However, increased maintenance efforts are required to correct the deficiencies which now exist.

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The dam is located in the Town of Norwich on Ransford Creek, approximately 8100 feet upstream of the Chenango River. Ransford Creek joins the Chenango River at the City of Norwich, approximately forty-five miles upstream of the Susquehanna River at Binghamton, New York.

The watershed (shown on the Watershed Map on Page C-5 in Appendix C) consists of 2424 acres (3.79 square miles) of hilly uplands. It is divided into two subwatersheds, one has typical slopes of 15± percent while the other has slopes ranging from 5 to 10 percent. Land within the watershed is primarily agricultural with extensive open fields.

Two watercourses flow into the reservoir; each is a small perennial stream with a typical flow width of 10 feet and a typical flow depth of 6 inches.

5.2 ANALYSIS CRITERIA

The purpose of the hydrologic/hydraulic analysis is to evaluate the spillway capacity and the potential for overtopping. The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers HEC-1 Computer Model - Dam Safety Version. The procedure included determining the Probable Maximum Flood (PMF) runoff from the watershed and routing the inflow hydrograph through the impoundment to determine the outflow hydrograph. The unit hydrograph was defined by the Snyder Synthetic Unit Hydrograph method, and the Modified Puls routing procedure was incorporated.

The initial rainfall loss was assumed to be 1.0 inches, and the uniform rainfall loss was assumed to be 0.1 inches per hour. In accordance with recommended guidelines of the Corps of Engineers, the Probable Maximum Precipitation (PMP) was 20.2 inches (24 hour duration, 200 square mile area).

The analysis was conducted for both the full PMF and for several fractional PMF conditions. The PMF inflow of 8626 CFS was routed through the reservoir and the peak outflow was determined to be 8626 CFS.

5.3 SPILLWAY CAPACITY

The total outlet capacity is the sum of the discharges from the principal spillway and the emergency spillway.

The principal spillway consists of a two stage broad-crested overflow weir, one stage being 16.7 feet long and the other

13.0 feet long. The right weir is at a lower elevation (1244.1 NGVD) than the left weir (1245.4 NGVD) and has 2.5 feet of adjustable flashboards.

The emergency spillway consists of a concrete apron at the inlet that acts as a weir for certain stages and two 48 inch diameter corrugated metal pipes (CMP).

The stage discharge data for the combined principal and emergency spillways was calculated for the stages tabulated below:

Stage (Feet)	Discharge Capacity (CFS)	Element of Structure
1244.1	0	Right Broad-Crested Weir
1244.4	6	--
1245.4	69	Left Broad-Crested Weir
1245.6	95	Emergency Spillway Crest
1246.4	263	--
1247.4	487	--
1248.4	746	--
1249.0	934	Top of Dam

The total spillway capacity at the top of the dam is 934 CFS.

The principal spillway can pass the peak outflow from a flood equal to approximately 3 percent of the PMF before use of the emergency spillway would be required.

5.4 RESERVOIR CAPACITY

The storage capacity of the reservoir was obtained primarily from the records of the Norwich Water Department as indicated below:

Stage (Feet)	Storage (Acre-Feet)	Storage (Inches of Runoff)
1244.1	176	0.87
1245.4	187	0.93
1245.6	189	0.94
1249.0	222	1.10

5.5 FLOODS OF RECORD

No data regarding floods of record was obtained for this dam.

5.6 OVERTOPPING POTENTIAL

The results of the HEC-1 DB computer analysis indicate that the crest of the dam is overtopped by all storms exceeding 13 percent of the outflow from the PMF event. The PMF discharge rate of 8626 cubic feet per second (CFS) would occur at a peak flood stage of 1252.7 feet, which is 3.7 feet above the crest of the dam.

The results of the analysis are tabulated below:

Flood Condition	Peak Inflow (CFS)	Peak Outflow (CFS)	Maximum Stage Elevation (NGVD)
0.5 PMF	4313	4313	1251.0
1.0 PMF	8626	8626	1252.7

5.7 EVALUATION

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the combined capacity of the principal and emergency spillways is not adequate to pass either the full PMF or one half the PMF; only approximately 13 percent of the outflow from the PMF can be safely passed before overtopping will occur. The PMF event would overtop the dam for a duration of 13 hours and the maximum depth of flow over the crest would be 3.7 feet. It is estimated that as a result of overtopping, breaching of the dam would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, nonemergency.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

There was no visible evidence of major settlement, lateral movement or other signs of overall structural instability of the dam during the site examination. Based on the conditions that were observed, there is no reason to question the static structural stability of the dam.

b. Design and Construction Data

The drawings entitled "Storage Reservoir Embankment, Upper Location", "Waste Weir" and "Bypass Canal" for the Norwich Reservoir No. 2 Dam (See Appendix F) show a configuration for the embankment, principal spillway and discharge channel that generally corresponds to the conditions observed on March 13, 1981, with the following exceptions:

1. The discharge is no longer through the 36 inch diameter cast iron pipe into the lower reservoir.

2. An earthern berm has been constructed at the downstream toe of the embankment.

3. Flashboards were installed on the principal spillway weir in 1913.

4. The emergency spillway was built in 1967.

There is no construction data to confirm the actual physical properties and configuration of the earthfill or the puddled core in the embankment. However, the dam proportions are considered to be reasonable for the soils that were available at the site and the dam would be expected to have adequate safety margins with respect to stability under static loading conditions.

c. Seismic Stability

The Norwich Reservoir No. 2 Dam is located in Seismic Zone 1, and in accordance with recommended Phase I guidelines does not require seismic analysis.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Condition

On the basis of the visual examination, the embankment and appurtenances of the Norwich Reservoir No. 2 Dam are considered to be in good condition. There were no signs of impending structural failure or other conditions which would warrant urgent remedial action; however, a number of minor deficiencies were noted.

b. Adequacy of Information

The evaluation of the embankment portions of this dam is based primarily on visual examination, reference to available plans, approximate hydraulic and hydrologic computations, and application of engineering judgement. The available information that was obtained is adequate for the purposes of a Phase I assessment.

c. Need for Additional Investigations

It is recommended that the following additional investigations be performed by a registered professional engineer engaged by the owner:

1. Conduct a detailed hydrologic and hydraulic analysis to determine the need for and methods of increasing the discharge capacity of the dam. This would include investigating the adequacy of the principal spillway weir and discharge channel (bypass canal) and the emergency spillway.

2. Verify the location, methods of construction and if possible, the condition of the outlet modifications (where the 36 inch former principal spillway was cut off and flow was diverted to the twin 12 inch pipes leading to the lower reservoir).

d. Urgency

It is recommended that within 3 months of the final approval date of this report, the necessary hydrologic investigation should be undertaken and within 6 months, the remaining investigation should commence. Appropriate remedial measures for both of the additional investigations described in Section 7.1c should be completed within 18 months of the final approval of the report. Corrective measures listed in Section 7.2 should be accomplished within 12 months of final approval.

7.2 RECOMMENDED MEASURES

It is considered important that the following items be accomplished in addition to any items required as a result of the additional investigations recommended in Section 7.1c:

a. Remove all spruce trees that are growing between the crest and lower berm on the left side of the downstream embankment slope, and also any whose trunks or roots may be encroaching onto the right side of the embankment. Trees growing on the abutments may remain. The trees to be removed constitute a potential hazard if uprooted during a storm. This may lead to a loss of freeboard, to a dangerous reduction of embankment width, or to the formation of piping channels if uprooted and the remaining roots rot in place.

b. The trunks of all cut trees are to be removed and backfilled. Equipment and procedures for this maintenance operation should be such as to avoid damage to existing grass and weed cover on the slopes. Any slopes that become scarred by runoff or traffic should be reseeded and mulched.

c. Patch the cracks in the concrete apron and repair the separation between the concrete headwall and apron of the emergency spillway inlet to prevent water from flowing up from beneath the apron.

d. Place rockfill in the bypass canal below the outlet headwall of the emergency spillway where undermining has begun.

e. Ensure the reservoir drain and its controls are operational.

f. Backfill and regrade the areas of minor surface sloughs on the downstream slope.

g. Regrade the dam crest to remove vehicle ruts and shallow depressions and allow surface runoff without concentrated flow. A gravel surface layer would improve trafficability and reduce rutting.

h. Continue to periodically cut the brush on the embankment slopes and the bypass canal bottom to prevent their being overgrown.

i. Fill in the animal burrows observed on the embankment slopes.

j. Develop and implement a flood warning and emergency evacuation plan to downstream residents public in the event

conditions occur which could result in the failure of the dam.

APPENDIX A

PHOTOGRAPHS

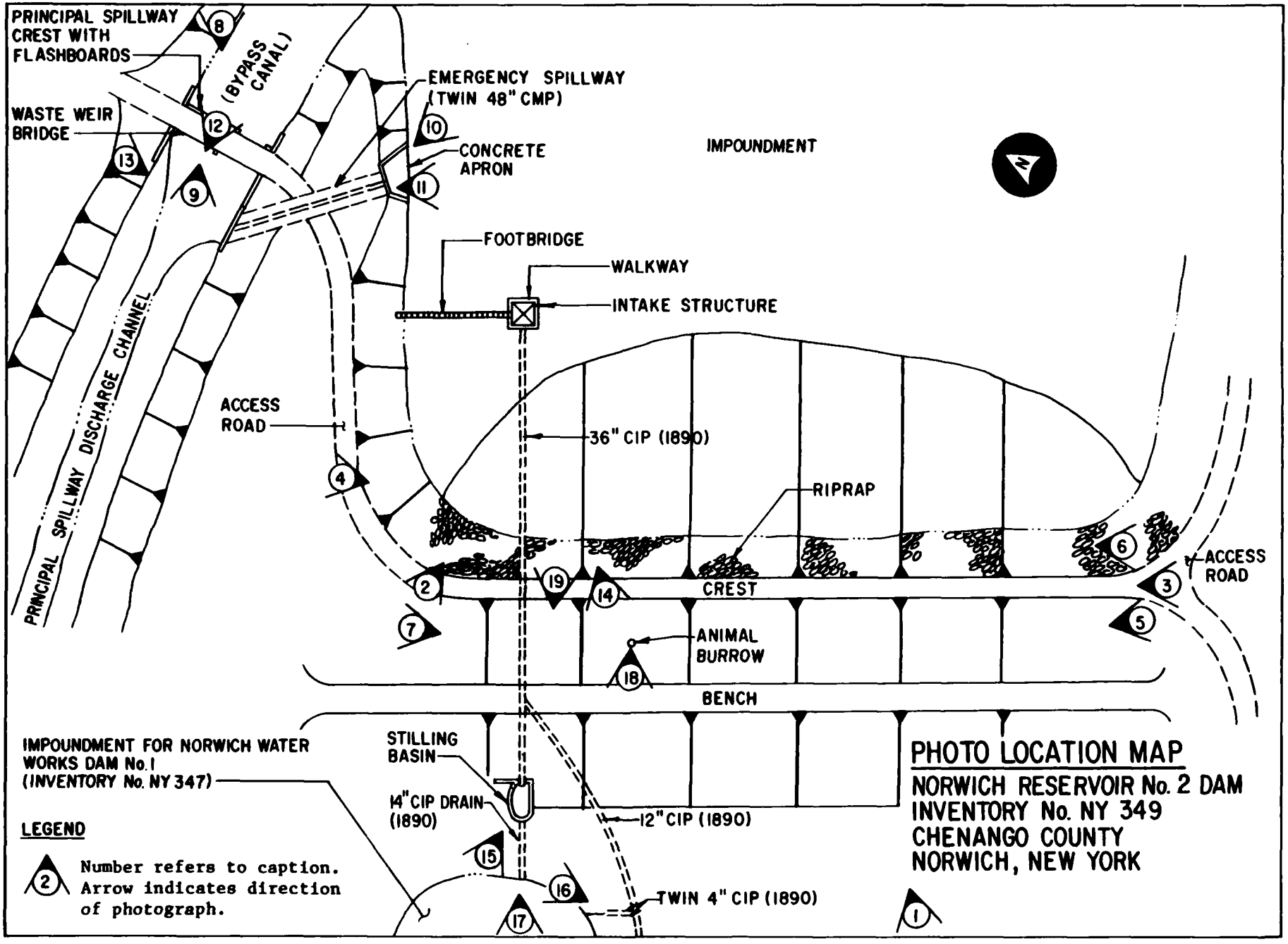

PRINCIPAL SPILLWAY CREST WITH FLASHBOARDS
(BYPASS CANAL)
EMERGENCY SPILLWAY (TWIN 48" CMP)
WASTE WEIR BRIDGE
CONCRETE APRON
IMPOUNDMENT
FOOTBRIDGE
WALKWAY
INTAKE STRUCTURE
PRINCIPAL SPILLWAY DISCHARGE CHANNEL
ACCESS ROAD
36" CIP (1890)
RIPRAP
ACCESS ROAD
CREST
ANIMAL BURROW
BENCH
IMPOUNDMENT FOR NORWICH WATER WORKS DAM No. 1 (INVENTORY No. NY 347)
STILLING BASIN
14" CIP DRAIN (1890)
12" CIP (1890)
TWIN 4" CIP (1890)
LEGEND
Number refers to caption. Arrow indicates direction of photograph.
PHOTO LOCATION MAP
NORWICH RESERVOIR No. 2 DAM
INVENTORY No. NY 349
CHENANGO COUNTY
NORWICH, NEW YORK

PHOTO #2: Overview of impoundment

PHOTO #3: Crest of dam looking toward right abutment

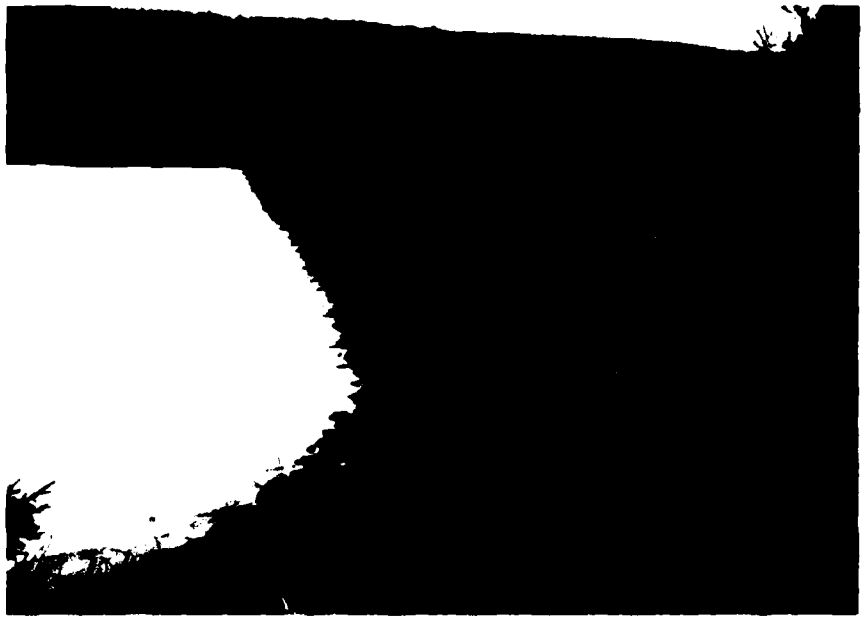


PHOTO #4: Overview of upstream face of dam

PHOTO #5: Overview of downstream face of dam

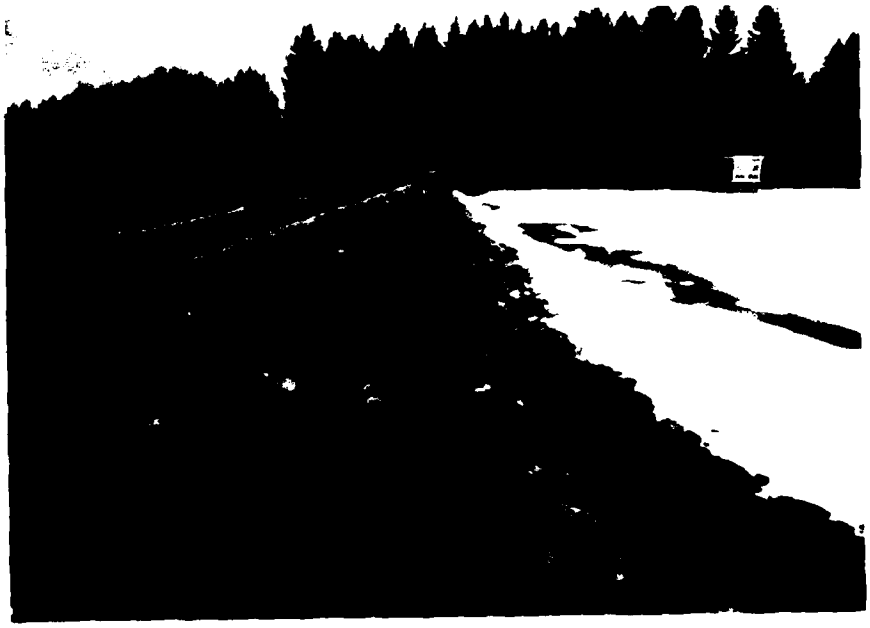


PHOTO #6: Upstream face of dam

PHOTO #7: Downstream face of dam

PHOTO #8: View of principal spillway from upstream

PHOTO #9: Closeup of flashboards from downstream

PHOTO #10: View of emergency spillway (twin 48" corrugated metal pipes - CMP) from upstream

PHOTO #11: Seepage through joint between concrete headwall and apron

PHOTO # 12: Outlet of emergency spillway and downstream channel conditions

PHOTO #13: Closeup of emergency spillway outlet

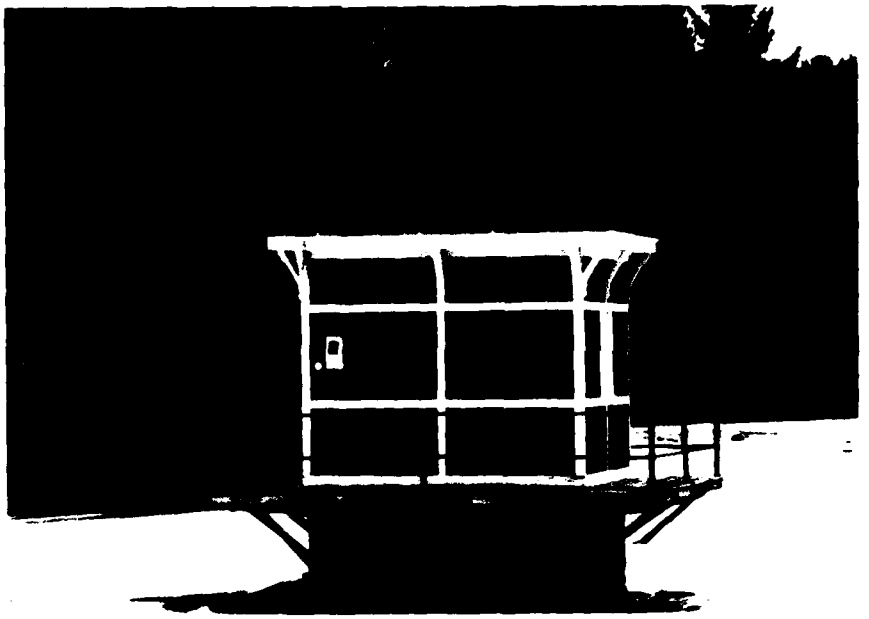


PHOTO #14: Intake structure

PHOTO #15: Outlet works (36" cast iron pipe - CIP)

PHOTO #16: 4" CIP outlet pipe flowing nearly full

PHOTO #17: 14" CIP drain from outlet works (shown in Photo #15)

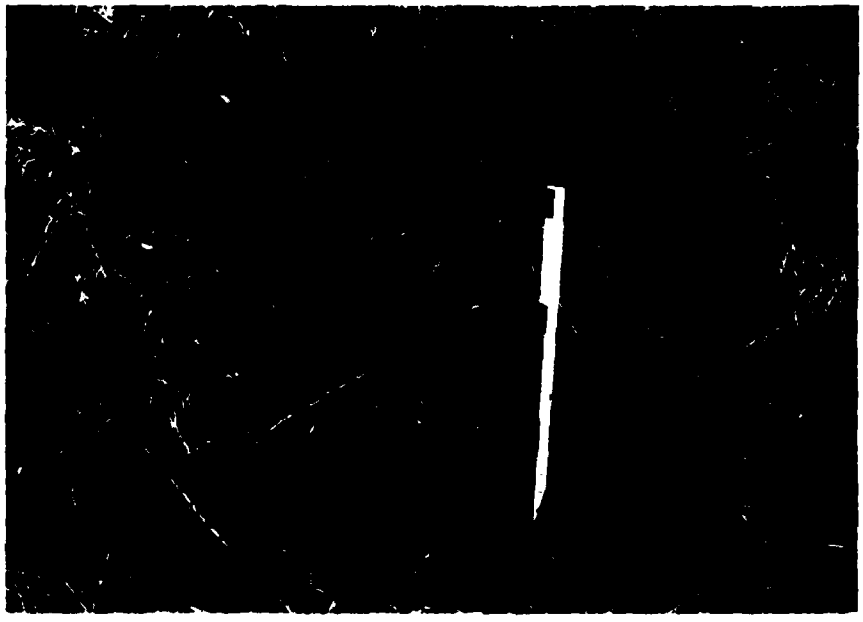


PHOTO #18: Animal burrow

PHOTO #19: Downstream channel conditions - impoundment for Norwich Water Works Dam No. 1 (Inventory No. NY 347)

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Norwich Reservoir No. 2 Dam

Fed. I.D. # NY 349 **DEC Dam No.** 117C-621

River Basin Susquehanna

Location: Town Norwich **County** Chenango

Stream Name Ransford Creek

Tributary of Chenango River

Latitude (N) 42° - 33.0' **Longitude (W)** 75° - 29.3'

Type of Dam Earthen embankment

Hazard Category High

Date(s) of Inspection March 13, 1981

Weather Conditions Overcast, 40° ±F.

Reservoir Level at Time of Inspection Elevation 1244.2 (NGVD)

b. Inspection Personnel

R.C. Smith, T.L. Ward & R.A. Criscuolo of Flaherty Giavara Associates, P.C.; J.J. Rixner & C.W. Eller of Haley & Aldrich, Inc.; E. Thomas of Salmon Associates.

c. Persons Contacted (Including Address & Phone No.)

Nicholas W. Andrews, Superintendent	Thomas J. Natoli, City Engineer
Norwich Water Department	City of Norwich
City of Norwich	P.O. Box 430
31 East Main Street	31 East Main Street
Norwich, New York 13815	Norwich, New York 13815
(607) 334-6618	(607) 334-4427

d. History:

Date Constructed 1890 **Date(s) Reconstructed** Never

Designer Norwich Water Works; W.S. Franklin, Chief Engineer

Constructed By Troy Public Works Company - Limited

Owner City of Norwich

2) **Embankment**

a. **Characteristics**

(1) **Embankment Material** Compacted earth material

(2) **Cutoff Type** Compacted clay and gravel (puddled)

(3) **Impervious Core** Compacted clay and gravel (puddled)

(4) **Internal Drainage System** None observed

(5) **Miscellaneous** No comments

b. **Crest**

(1) **Vertical Alignment** Good; minor wheel rutting in roadway

(2) **Horizontal Alignment** Good; angled upstream toward the left abutment

(3) **Surface Cracks** None observed

(4) **Miscellaneous** Mowed grass cover

c. **Upstream Slope**

(1) **Slope (Estimate - V:H)** 1:3

(2) **Undesirable Growth or Debris, Animal Burrows** Few mouse/mole burrows near the crest

(3) **Sloughing, Subsidence or Depressions** Slight surface erosion on right abutment

(4) **Slope Protection** Layer of riprap with flat platey shale extending within one foot of the crest; one foot strip of grass at crest; heavier grass and brush cover at the abutments.

(5) **Surface Cracks or Movement at Toe** None evident

d. **Downstream Slope**

(1) **Slope (Estimate - V:H)** 1:2

(2) **Undesirable Growth or Debris, Animal Burrows** Several woodchuck burrows near the toe of slope; pine and spruce (6 inch - 24 inch in diameter) cover the left abutment and slope.

(3) **Sloughing, Subsidence or Depressions** Two minor surface sloughs were noted near the right abutment; some erosion of surface soil through the stone below

(4) **Surface Cracks or Movement at Toe** None observed

(5) **Seepage** None evident

(6) **External Drainage System (Ditches, Trenches, Blanket)** None observed

(7) **Condition Around Outlet Structure** Dry stone masonry stilling basin in good condition

(8) **Seepage Beyond Toe** None observed

e. **Abutments - Embankment Contact**

Right: good condition

Left: good condition

(1) **Erosion at Contact** None apparent

(2) **Seepage Along Contact** None observed

3) **Drainage System**

a. **Description of System** Masonry and wood intake structure with a 36 inch diameter cast iron pipe (CIP) feeds water into the distribution system through a 12 inch CIP from which two 4 inch CIP blowoffs discharge into the lower reservoir (NY 347)

b. **Condition of System** Fair; some valves have not been opened or closed in years and may be inoperable

c. **Discharge from Drainage System** Stilling basin and rirapped outlet

4) **Instrumentation** (Monumentation/Surveys, Observation Wells, Weirs, Peizometers, Etc.)

None observed

5) **Reservoir**

a. **Slopes** Moderately to steeply sloping woodlands

b. **Sedimentation** No apparent problems

c. **Unusual Conditions Which Affect Dam** None apparent

6) **Area Downstream of Dam**

a. **Downstream Hazard (No. of Homes, Highways, etc.)** Approximately 2 dwellings, a large trailer park (30 to 40 trailers), 4 commercial buildings, two major roads (including New York Route 23) and high voltage transmission lines are within the dam failure flood hazard area

b. **Seepage, Unusual Growth** None observed

c. **Evidence of Movement Beyond Toe of Dam** None evident

d. **Condition of Downstream Channel** Not applicable

7) **Spillway(s) (Including Discharge Conveyance Channel)**

Principal spillway, emergency spillway and discharge conveyance channel (bypass canal)

a. **General** Principal spillway and discharge conveyance channel (bypass canal) handle normal flows while the emergency spillway conveys flow during overflow conditions

b. **Condition of Principal Spillway** Good; minor seepage around right abutment; some open joints in masonry

c. **Condition of Emergency Spillway** Some seepage through the joint between the concrete apron and headwall at the inlet to the twin 48 inch CMP; cracks observed in the concrete apron; the center of the concrete endwall has been undermined by 9 ± inches.

d. **Condition of Discharge Conveyance Channel** Fair; side slopes have a moderate growth of trees and brush but appear stable

8) **Reservoir Drain/Outlet**

Type: Pipe X Conduit _____ Other _____

Material: Concrete _____ Metal X Other _____

Size: 36 inch cast iron pipe (CIP) **Length** 200 feet

Invert Elevations: Entrance 1205.0 (NGVD) **Exit** 1199.4 (NGVD)

Physical Condition (Describe): **Unobservable** _____

Material: Rust was visible at the outlet

Joints: Unobservable **Alignment** Straight

Structural Integrity: Good

Hydraulic Capability: Good; pipe is used for water supply for the City of Norwich

Means of Control: Gate _____ Valve X Uncontrolled _____

Operation: Operable _____ Inoperable _____ Uncontrolled _____

Present Condition (Describe): Unknown; the valve was not operated during the inspection

9) **Structural**

a. **Concrete Surfaces** Concrete surfaces of the emergency spillway inlet have several cracks.

b. **Structural Cracking** Minor shrinkage cracks were observed

c. **Movement - Horizontal & Vertical Alignment (Settlement)** Numerous settlement cracks up to ¼ inch wide at the inlet (See the sketch on page B-11)

d. **Junctions with Abutments or Embankments** A 3/8 inch separation was observed between the headwall and the right wingwall (See the sketch on page B-11)

e. **Drains - Foundation, Joint, Face** None evident

f. **Water Passages, Conduits, Sluices** 36 inch cast iron water supply pipe from the intake structure having a 12 inch cast iron pipe branching off to the distribution system.

g. **Seepage or Leakage** Some seepage was noted through the joint separation mentioned in 9)d. above.

h. **Joints - Construction, etc.** Some open joints in stone masonry of the principal spillway; no indication of reinforcement between the wingwalls and the headwall of the emergency spillway inlet.

i. **Foundation** Inaccessible

j. **Abutments** Minor openings in masonry joints as noted in 9)h. above

k. **Control Gates** Valves control the flow of water to the distribution system

l. **Approach & Outlet Channels** Concrete surface is cracked at the approach to the emergency spillway.

m. **Energy Dissipators (Plunge Pool, etc.)** Stilling basin at the outlet of the 36 inch diameter cast iron water supply pipe.

n. **Intake Structures** Stone masonry and wood structure with access footbridge in good condition

o. **Stability** Appears to be stable

p. **Miscellaneous** No comments

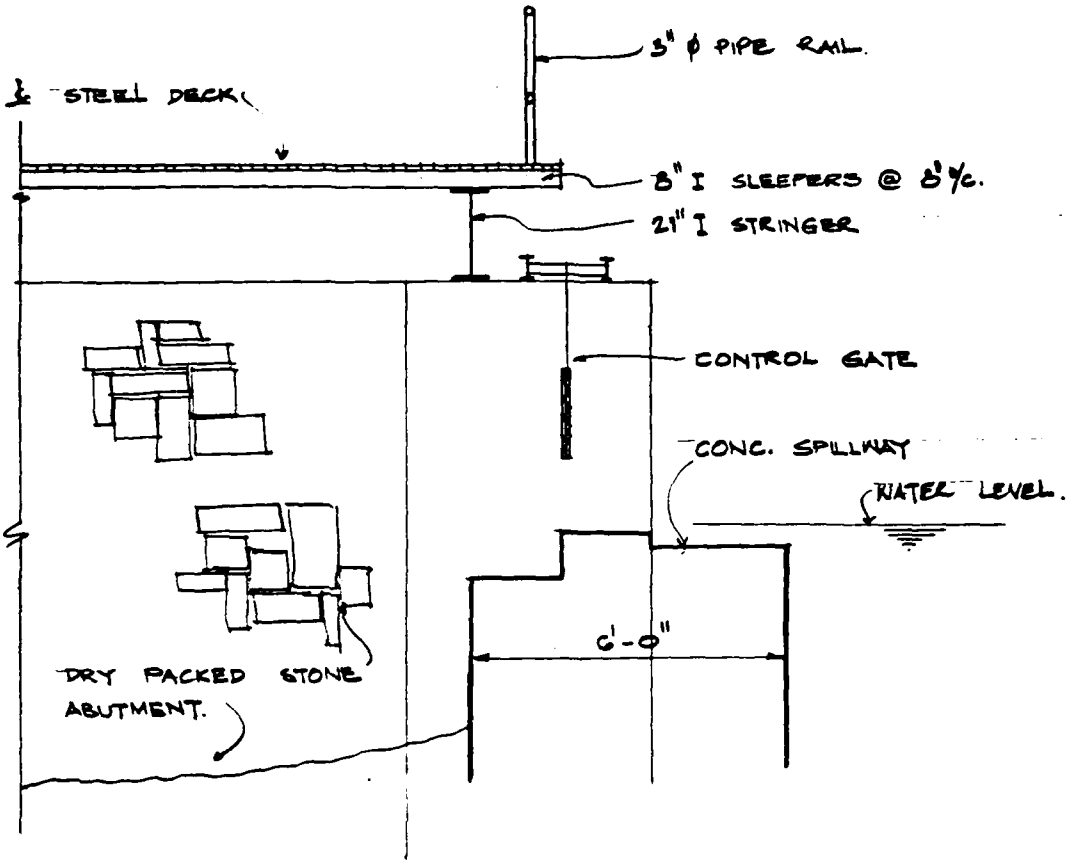
10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition

1. Intake structure: It appears to be in good condition.

2. Bridge over principal spillway weir: Good condition.

FED I.D NO : 349



SECTION THRU CONC. SPILLWAY AT BRIDGE.

(N.T.S)

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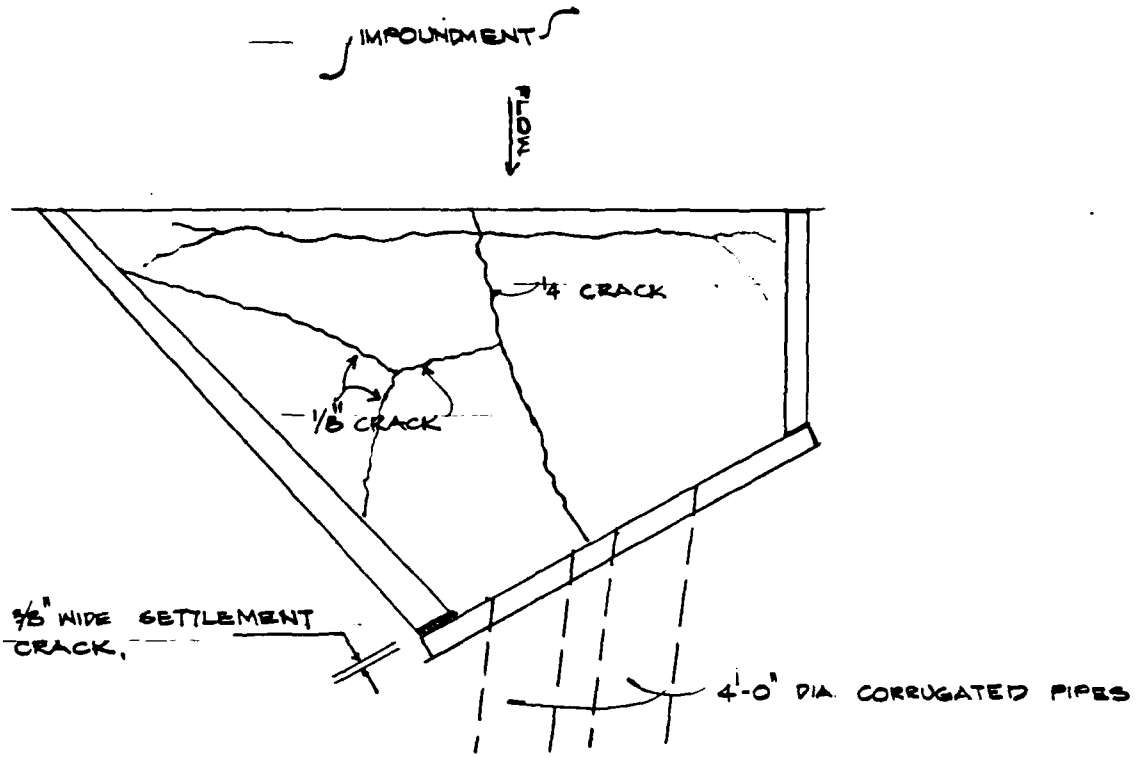
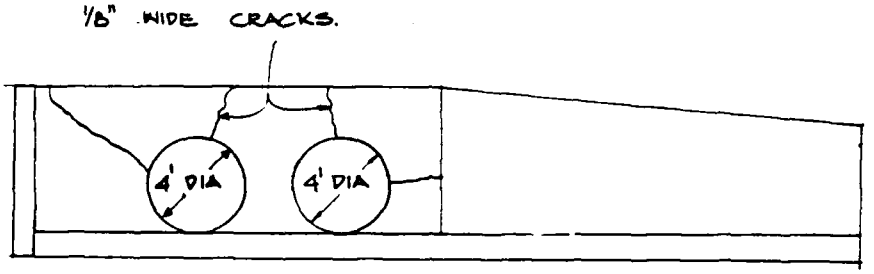


PLAN OF EMERGENCY SPILLWAY.

(N.T.S)

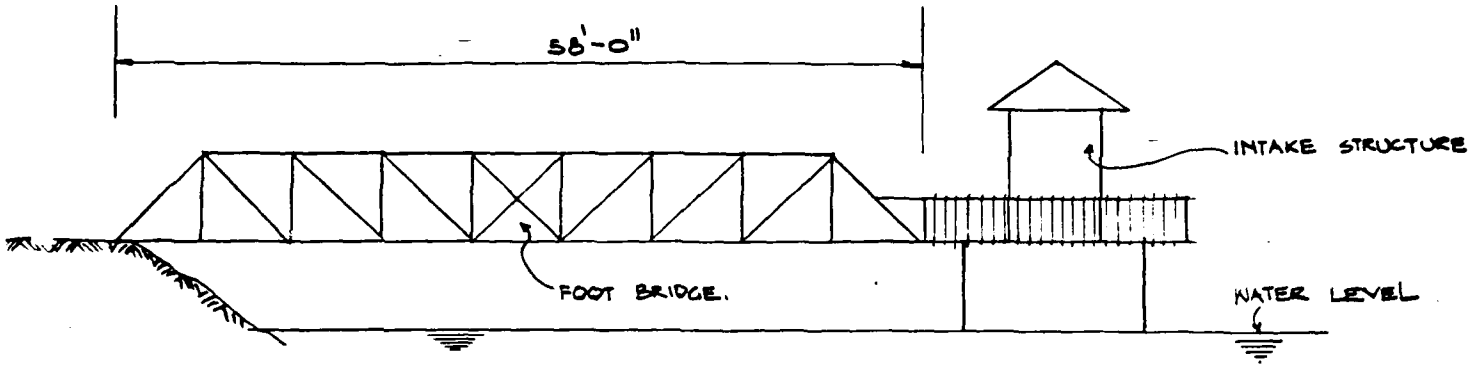


ELEVATION OF EMERGENCY SPILLWAY.

(N.T.S)

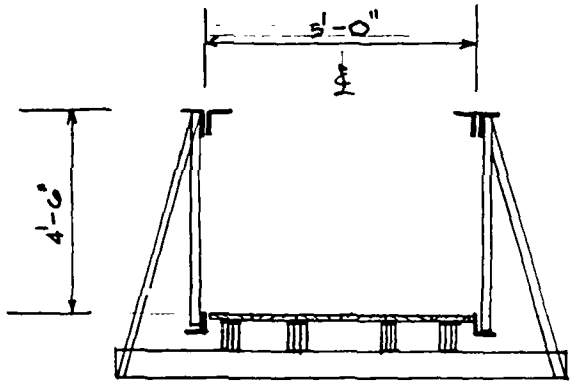
NAME OF DAM : NORWICH RESERVOIR Nº2

FED. I.D. Nº : 349



· ELEVATION OF INTAKE STRUCTURE & FOOT BRIDGE ·

(N.T.S)



SECTION THRU FOOT BRIDGE.

(N.T.S)

APPENDIX C

HYDROLOGIC/HYDRAULIC ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	1249.0	12.0	222
2) Design High Water (Max. Design Pool)	--	--	--
3) Emergency Spillway Crest	1245.6	10.0	189
4) Pool Level with Flashboards	1245.4	9.9	187
5) Principal Spillway Crest	1244.1	9.1	176

DISCHARGES:

	Volume (cfs)
1) Average Daily	Unknown
2) Emergency Spillway @ Maximum High Water (Top of Dam)	126
3) Principal Spillway @ Maximum High Water (Top of Dam)	808
4) Principal Spillway @ Emergency Spillway Crest	95
5) Low Level Outlet @ Principal Spillway Crest	--
6) Total (of all facilities) @ Maximum High Water	934
7) Maximum Known Flood	Unknown
8) At Time of Inspection	0

CREST: **ELEVATION:** 1249.0

Type Vegetated earthen embankment

Width 10 feet **Length** 638 feet

Spillover Cut stone masonry and concrete spillway

Location Beyond and upstream of the right abutment

SPILLWAY:

PRINCIPAL		EMERGENCY
1244.1 (NGVD)	**Elevation**	1245.6 (NGVD)
Broad-crested weirs	**Type**	Twin 48 inch CMP
13.0 feet and 16.7 feet	**Width**	15 feet @ entrance to pipes; 32 feet @ concrete apron
	Type of Control	
Weir	**Uncontrolled**	Weir
--	**Controlled**	--
Flashboards	**Type: (Flashboards; gate)**	None
One	**Number**	One
2.5 feet high/ 16.7 feet	**Size/Length**	32 foot weir/ 18 feet long 2-48 inch CMP/112 feet long
Reinforced concrete	**Invert Material**	Reinforced concrete and corrugated metal
Continuously	**Anticipated Length of Operating Service**	Unknown
Not applicable	**Chute Length**	18 feet
1 ± foot	**Height Between Spillway Crest & Approach Channel Invert (Weir Flow)**	1 ± foot

Type:

Location:

Records:

Date Unknown

Max. Reading Unknown

FLOOD WATER CONTROL SYSTEM:

Warning System None in effect

Method of Controlled Releases (mechanisms) Valves used to control flow to the water distribution system; flashboards used to regulate reservoir levels.

DRAINAGE AREA: 2424 acres = 3.79 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type Rural, agriculture

Terrain - Relief Moderate slopes

Surface - Soil Glacial till

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

Primarily open fields with scattered woodlands; glacial till soils; average watershed slope is 5 to 10 percent; some residential homes and roadways.

Potential Sedimentation problem areas (natural or man-made; present or future)

None

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

None

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the reservoir perimeter:

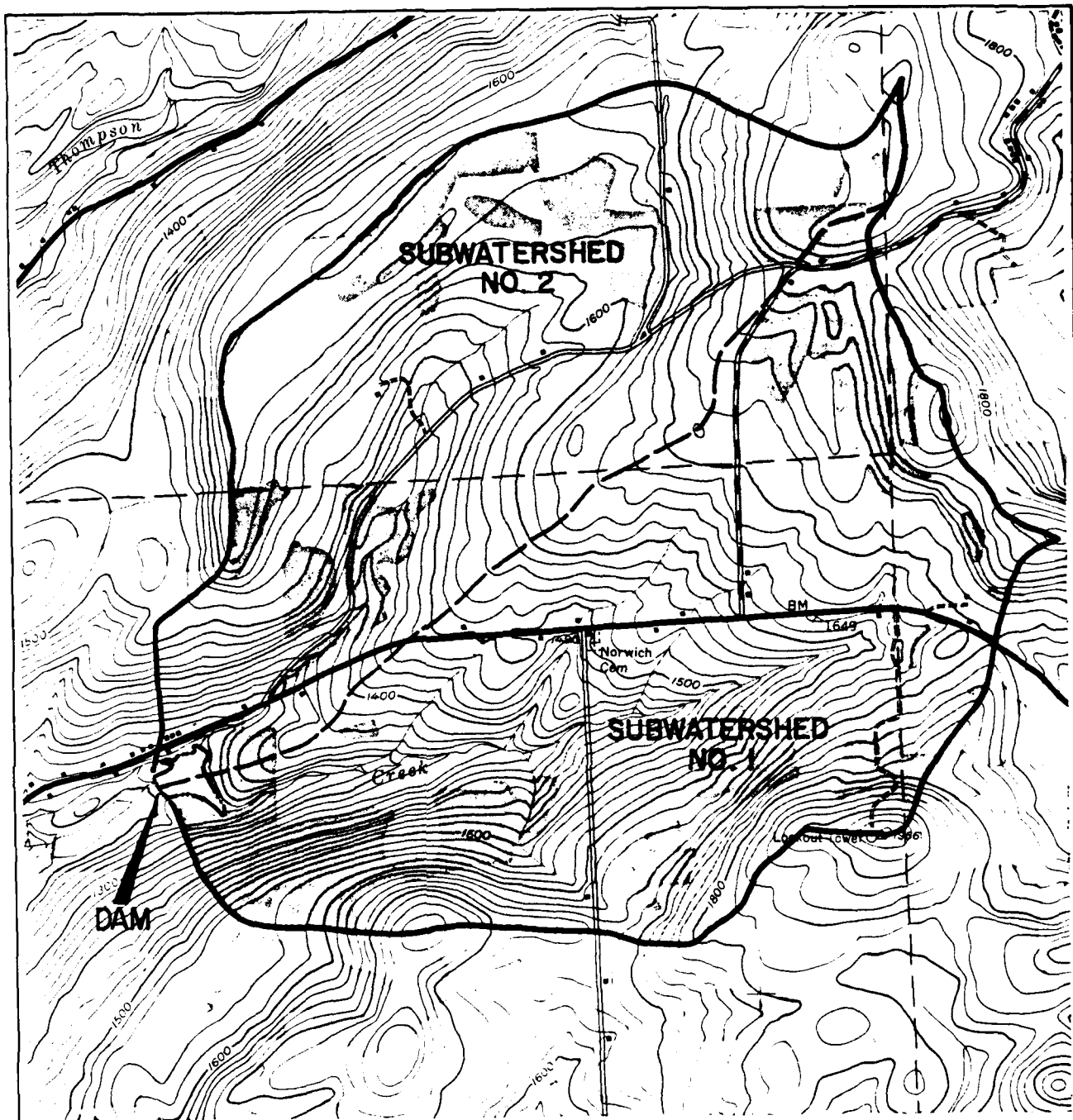
Location: None

Elevation:

Reservoir:

Length @ Maximum Pool 1000 ± feet = 0.2 miles (Miles)

Length of Shoreline (@ Spillway Crest) 3500 ± feet = 0.7 miles (Miles)



WATERSHED MAP

NORWICH RESERVOIR No. 2 DAM
INVENTORY No. NY 349

SUSQUEHANNA RIVER BASIN
CHENANGO COUNTY
NORWICH, NEW YORK

N

0 2000 4000

SCALE IN FEET

FLAHERTY · GIAVARA ASSOCIATES, P.C.

CALCULATIONS

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

PROJECT [illegible]

SHEET NO. [illegible] OF 15
BY [illegible] DATE [illegible]
CHK'D. BY TLW DATE 5-7-81

WATERSHED DATA FOR [illegible] HYDROGRAPH

1) Time to Peak - Sub-Watershed No. 1

L = 15,500 ft = 2.94 miles

L_c = 8,000 ft = 1.52 miles

C_t = 2.0 for average slopes

$T_p = 2.0(2.94 \times 1.52)^{0.3} = 3.13$ Hours

$t_r = \frac{t_p}{5.5} = \frac{3.13}{5.5} = 0.57$ USE $t_R = 0.5$

$t_{pR} = t_p + 0.25(t_R - t_r)$

$= 3.13 + 0.25(0.5 - 0.57) = 3.11$ Hours

DRAINAGE AREA = 1340.7 ACRES = 2.09 mi^2

2) Time to Peak - Sub-Watershed No. 2

L = 15,000 ft = 2.84 miles

L_c = 7000 ft = 1.33 miles

C_t = 2.0 for average slopes

$T_p = 2.0(2.84 \times 1.33)^{0.3} = 2.98$ Hours

$t_r = \frac{t_p}{5.5} = \frac{2.98}{5.5} = 0.54$ USE $t_R = 0.5$

$t_{pR} = t_p + 0.25(t_R - t_r)$

$= 2.98 + 0.25(0.5 - 0.54) = 2.97$ Hours

Drainage Area = 1083.6 Acres [illegible]

3) % Impervious

[illegible]

Roads [illegible] × 25' = [illegible]
Houses 20 ± [illegible]

415 = 1.4 Acres

1.4 Acres [illegible]

Watershed No 2

Roads 18,000 ft² 1.0' = 450,000 ft²
House: 10± @ 1000 ft² = 10,000 ft²
460,000 ft² = 10.6 Acres

$\frac{10.6 \text{ Acres}}{1083.6 \text{ Acres}} = 1.0\%$

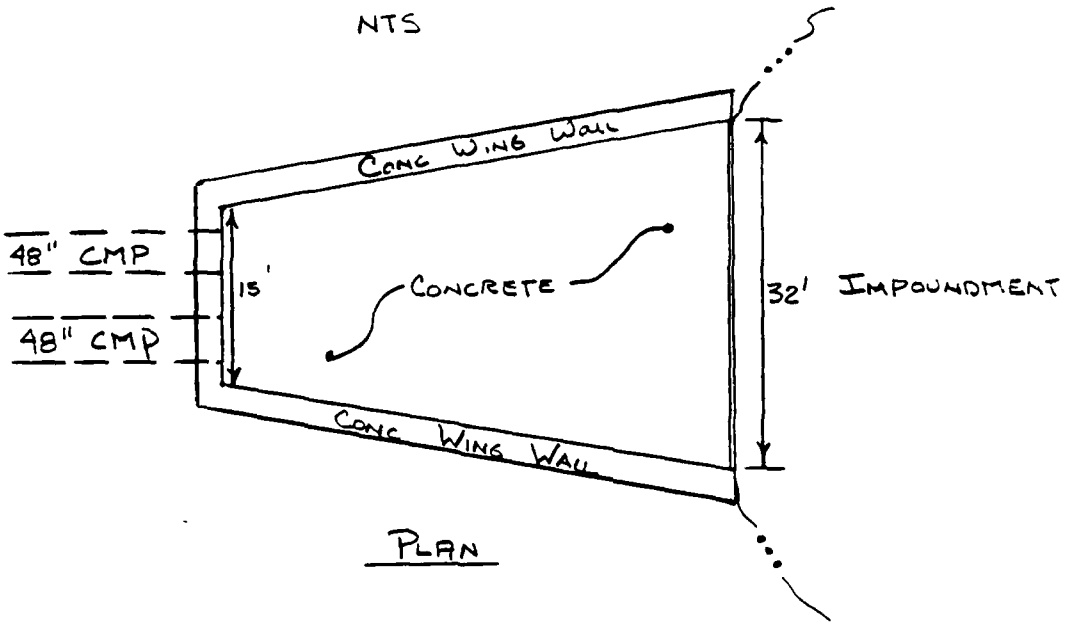
4) Rainfall Data (From Hydrometeorological Report No. 33).

24 Hour Duration PMP = 20.2 inches for 200 square miles

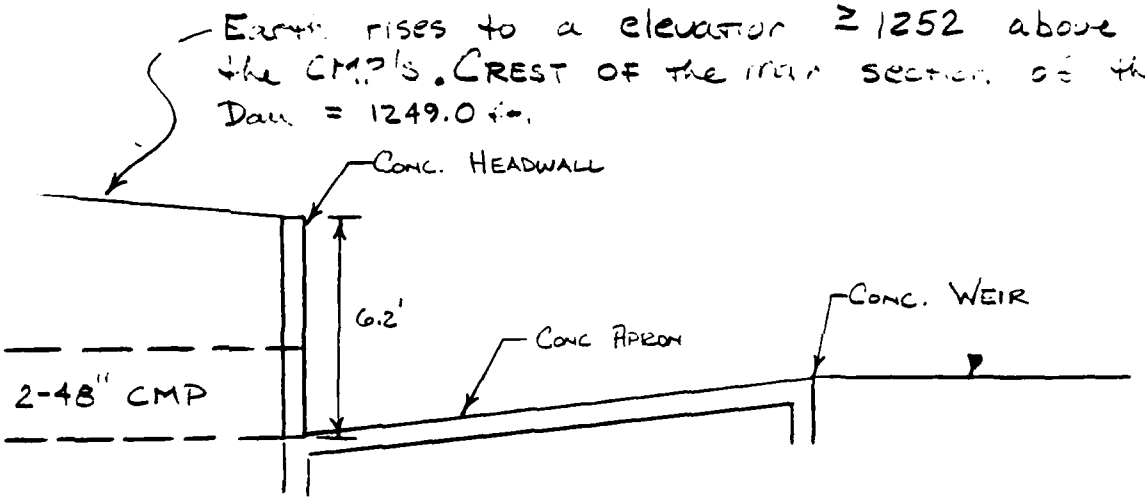
Duration (hr.)	Adj. Factor (%)
6	111
12	122
24	133
48	143

EMERGENCY SPILLWAY

NTS



PLAN



PROFILE

PROJECT ORDA DAM
NY 340

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 4 OF 13
BY RAC DATE 5-1-81
CHK'D. BY TLW DATE 5-7-81

EMERGENCY SPILLWAY

The outlet capacity of the emergency spillway (2-48" cmp) was assessed by examining the structure for different controlling flow conditions that may occur depending on the headwater on the structure. Flow conditions were looked at in the following order - A) Flow over the triangular concrete weir, B) assuming inlet control, C) assuming outlet control, and D) for open channel flow.

A stage discharge curve was plotted for the four flow conditions and a final stage discharge curve was derived from the plot by selecting the controlling discharge for a given stage. It was assumed that no submergence of the spillway will take place, but submergence is possible.

Overtopping of the dam was assumed to occur over the main crest of the dam only elevations. The HEC-1DE output reflect overtopping of the main section only (No low-flow Auxiliary).

EMERGENCY SPILLWAY

A) WEIR @ 2-48" PIPES

SLOPE OF triangular weir ≈ 10 to 1

$Q = C L H^{1.5}$

L = Length @ Impoundment = 32'

H(FT)	C	Q (CFS)	ELEV (MSL)
0	–	–	1245.6
0.2	2.82	8.1	1245.8
0.4	2.83	22.9	1246.0
0.6	2.86	42.5	1246.2
0.8	2.90	66.4	1246.4
1.0	2.91	93.1	1246.6
1.2	2.92	122.8	1246.8
1.5	2.93	172.2	1247.1

PROJECT _____

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 6 OF 13
BY [illegible] DATE 4-1-91
CHK'D. BY TLW DATE 5-7-91

STAGE DISCHARGE FOR EMBANKMENT [illegible]

2-42" CMP's

B) INLET CONTROL

D	H/D	Q	2Q	ELEV. (USGS)
1.2	0.3	1 CREST OF CONN. PIPE		1245.6
1.5	0.4	16	32	1245.9
[illegible]	0.5	23	46	1246.4
2.5	0.6	34	68	1246.8
3.0	0.8	55	110	1247.4
3.5	0.9	70	140	1247.8
4.0	1.0	73	[illegible]	1248.4
4.2	1.1	82	164	1248.8
4.6	1.2	11	[illegible]	249.0
5.0	1.3	100	[illegible]	1249.4
5.5	1.4	110	220	1249.8
[illegible]	1.5	119	238	1250.4
6.5	1.6	125	[illegible]	1250.9
7.0	1.8	140	280	1251.4

INLET AND OUTLET [illegible] NOMOGRAPHS FOR [illegible] TRANSMITTAL'S [illegible] CHARTS FOR [illegible] CULVERTS.

FOR INLET CONTROL APPROACH VELOCITY WAS NEGLECTED.

EMERGENCY SPILLWAY [illegible]

C) OUTLET CONTROL

L = 112'
n = 0.024
K_E = 0.5
Tw assume = To for [illegible], Elev = 1243.6
hw = H + h_o − LS_o = H + 4 − 0.3

H (FT)	Q (CFS)	2Q (CFS)	HW	ELEV USGS
0.5	40	80	4.2	1248.1
1.0	55	110	4.7	1248.6
2.0	77	154	5.7	1249.6
3.0	95	190	6.7	1250.6
4.0	110	220	7.7	1251.6
5.0	121	242	8.7	1252.6
6.0	135	270	9.7	1253.6
7.0	150	300	10.7	1254.6

D) OPEN CHANNEL FLOW

INV = 1243.9, flow starts @ 1245.9 due to [illegible]
n = 0.024

D (FT)	Q_{USGS} (CFS)	Q_{CALC} (CFS)	Q_{TOTAL} (CFS)	ELEVATION
0.5	1.4	1.0	2.4	1244.4
1.0	6.0	4.5	10.5	1244.9
1.5	13.5	10.5	24.0	1245.4
2.0	23.5	16.0	39.5	1245.9
3.0	45.0	31.0	76.0	1246.9
3.9	47.0	35.0	82.0	1247.8

OPEN CHANNEL FLOW FROM NOMOGRAPHS FOUND IN U.S. DEPARTMENT OF TRANSPORTATION, HYDRAULIC DESIGN SERIES NO. 3, (DESIGN CHARTS FOR OPEN CHANNEL FLOW).

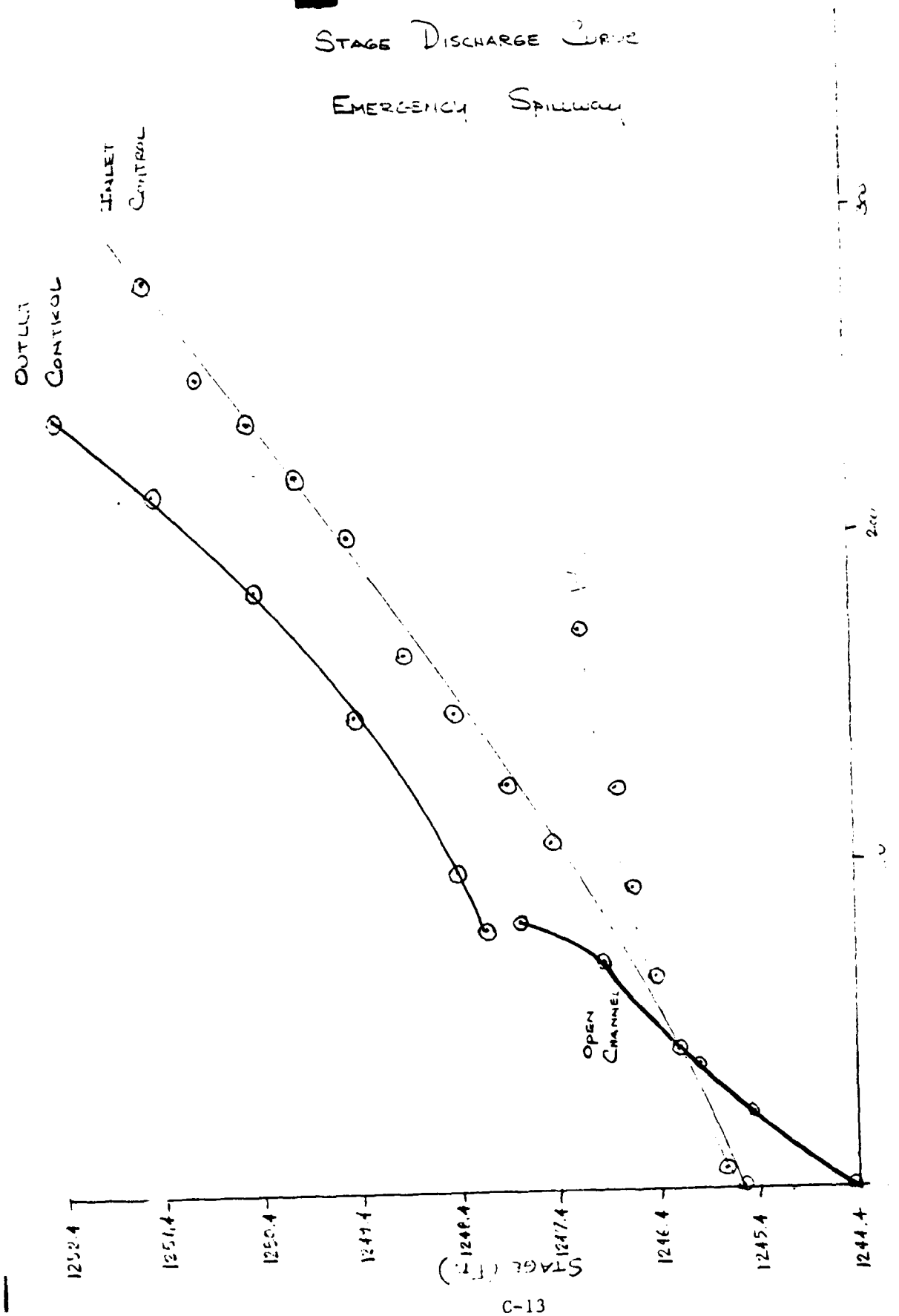
PROJECT 84-349

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA NEW HAVEN CONN 06510/203/789-1260

SHEET NO. 9 OF 13
BY PJC DATE 4-28-81
CHK'D. BY TLW DATE 5-7-81

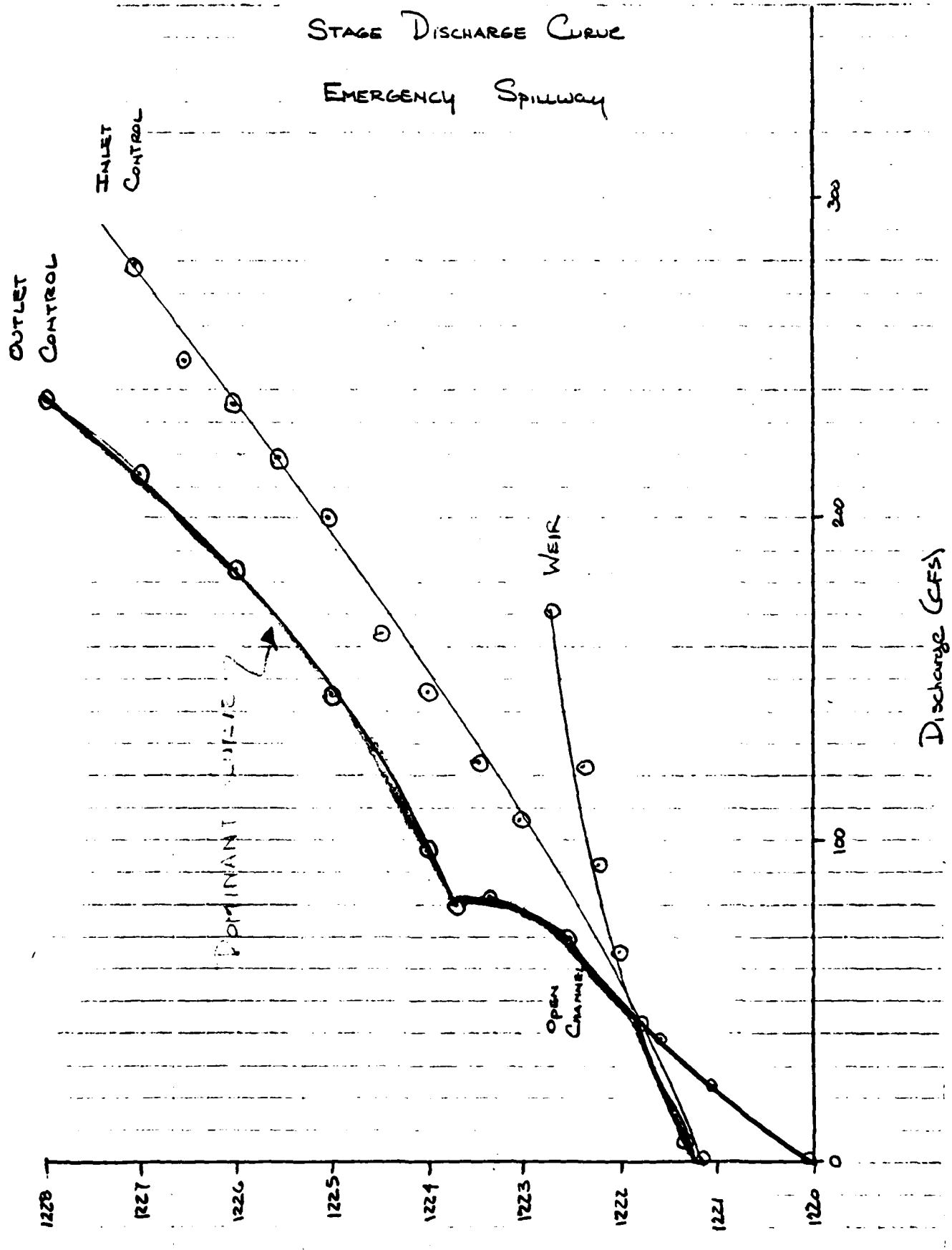
STAGE DISCHARGE CURVE

EMERGENCY SPILLWAY



STAGE DISCHARGE CURVE

EMERGENCY SPILLWAY

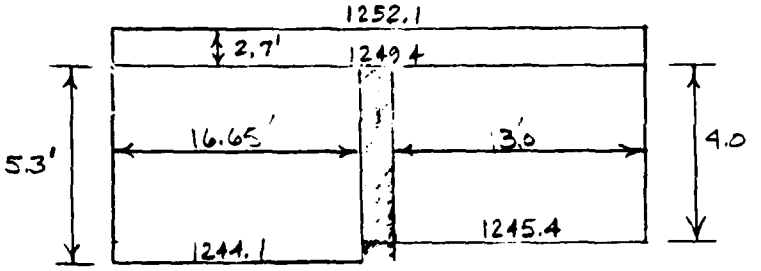


PROJECT _____

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 10 OF 13
BY _____ DATE _____
CHK'D. BY TLW DATE 5-7-81

PRINCIPAL SPILLWAY



C=3.0 C=3.0

$Q=(3)LH^{1.5}$

STAGE (FT)	DISCHARGE (CFS)
1244.1	0
1244.4	8.2
1245.4	74.0
1245.6	95.3
1246.4	213.2
1247.4	[illegible]
1248.4	[illegible]
1249.0	[illegible]
1249.4	[illegible]

@ 1250.4 $Q=CA\sqrt{2gH}$

$Q_1 = 0.6\,(88.25)\sqrt{12\times32.2\times3}$

$= 817.4$

$Q_2 = [illegible]$

$Q_T = 1251.1$ CFS

@ 1251.4

$Q = 0.6\,(88.25)\sqrt{12\times32.2\times4.7}$

$= 921.2$

$Q_2 = [illegible]$

$Q_T = 1922.0$ CFS

@ 1252.4

$Q = (0.6)(88.25)\sqrt{12\times32.2\times5.7}$

$= 1014.5$

$Q_2 = 0.6\,(88.25)\sqrt{12\times32.2\times5}$

$= 985.1$

$Q_3 = (2.5)(40)(0.2)^{1.5} = 16.4$

$Q_T = 1596.0$ CFS

③ 1253.4

$Q_1 = (0.6)(89.25)\sqrt{12 \times 32.2 \times 3.7}$ $Q_2 = (0.6)(52)\sqrt{12 \times 32.2 \times 3}$

$= 1099.$ $= 636.3$

$Q_3 = (2.5)(40)(1.3)^{1.5} = 148.2$

$Q_T = 1883.4$ cfs

② 1254.4

$Q_1 = (0.6)(89.25)\sqrt{12 \times 32.2 \times 7.7}$ $Q_2 = (96)(52)\sqrt{12 \times 32.2 \times 7}$

$= 1179.$ $= 662.4$

$Q_3 = (2.5)(40)(2.3)^{1.5} = 348.8$

$Q_T = 2190.3$ cfs

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

Cumulative Stage Discharge

Principal & Emergency Spillways

STAGE (FT)	PRINCIPAL (CFS)	EMERGENCY (CFS)	TOTAL (CFS)
1244.1	0	—	0
1244.4	8.2	—	8.2
1245.4	74.0	—	74.0
1245.6	95.3	—	95.3
1246.4	213.2	50.0	263.2
1247.4	409.7	77.0	486.7
1248.4	648.0	[illegible]	746.0
1249.0	8[illegible]8.2	[illegible]	934.2
1249.4	921.5	145.0	1066.5
1250.4	1251.1	183.0	1434.1
1251.4	1422.0	214.0	1636.0
1252.4	[illegible]	232.0	[illegible]
1253.4	1801.4	268.0	2129.4
1254.4	[illegible]	294.0	2484.2

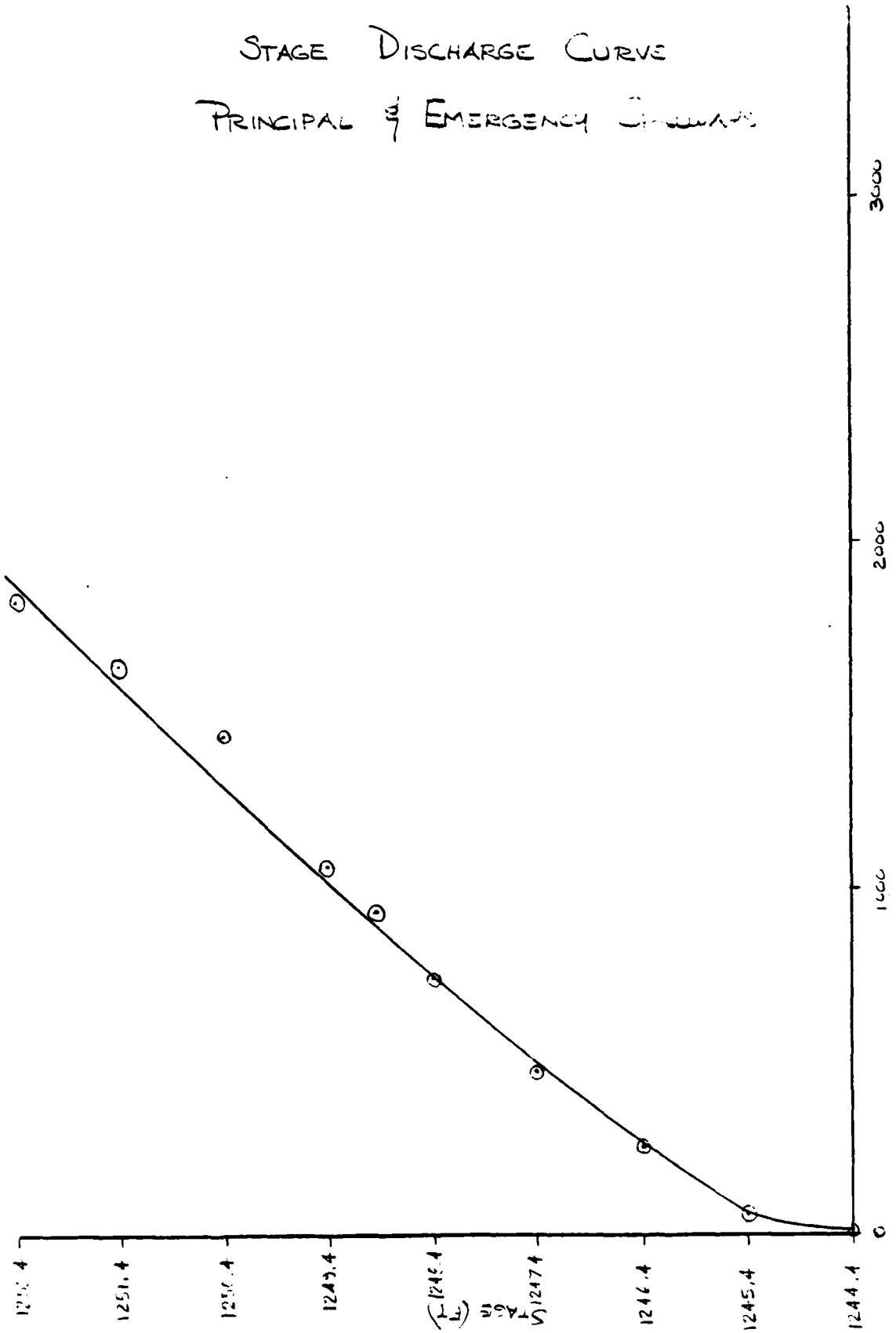
PROJECT

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 13 OF 15
BY DATE 4-2-81
CHK'D. BY TLW DATE 5-7-81

STAGE DISCHARGE CURVE

PRINCIPAL & EMERGENCY SPILLWAYS



HEC-1 FLOOD HYDROGRAPH COMPUTATIONS

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FLAHERTY GIAVARA ASSOCIATES, P C
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************

     1                A1  NATIONAL DAM INSPECTION PROGRAM, PHASE I REPORT, CORPS OF ENGINEERS - NEW YORK DISTRICT
     2                A2  DAM INVENTORY NO  NY 349, NORWICH RESERVOIR NO  2 DAM, CHENANGO COUNTY, NEW YORK, JUNE 27, 1981
     3                A3  PREPARED BY FLAHERTY GIAVARA ASSOCIATES, P.C., ONE COLUMBUS PLAZA, NEW HAVEN, CONNECTICUT
     4                B    120       0      30       0       0       0       0       2       0       0
     5                B1     5
     6                J      1       9       1
     7                J1   0 1     0 2     0 3     0 4     0 5     0 6     0 7     0 8     1 0
     8                K      0       1                       0       0       1       0
     9                K1  INFLOW HYDROGRAPH, SUB-WATERSHED NO  1, SNYDER METHOD
    10                M      1       1    2.09                   3.78       1                       1
    11                P      0    20 2     111     122     133     143
    12                T                                                       1     0 1             0 009
    13                W   3.11    0.63
    14                X   -2 0   -0 10     1 5
    15                K      0       1                       0       0       1       0
    16                K1  INFLOW HYDROGRAPH, SUB-WATERSHED NO  2, SNYDER METHOD
    17                M      1       1    1.69                   3.78       1                       1
    18                P      0    20 2     111     122     133     143
    19                T                                                       1                     0 01
    20                W   2.97    0.63
    21                X   -2.0   -0.10     1.5
    22                K      2       1                       0       0       1       0
    23                K1  INFLOW HYDROGRAPHS   SUB-WATERSHEDS NO  1 & NO  2 COMBINED
    24                K      1       1                       0       0       1       0
    25                K1  RESERVOIR ROUTING  MODIFIED PULS METHOD
    26                Y                                1       1
    27                Y1     3                                                0      -1
    28                Y41244 1  1244 4  1245 4  1245 6  1246 4  1247 4  1248 4  1249 0  1249 4  1250 4
    29                Y41251.4  1252 4  1253.4  1254.4
    30                Y5     0     8 2     74 0    95.3    263 2    486.7    746 0    934.2   1066 5   1434.1
    31                Y51636 0  1828 8  2129 4  2484 3
    32                $A   8 0    14 1    21 1
    33                $E1244.1  1254 4  1264.4
    34                $$1244 1
    35                $D1249.0     2 5     1 5   375 0
    36                K     99

1                          PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
                                  RUNOFF HYDROGRAPH AT              1
                                  RUNOFF HYDROGRAPH AT              1
                                  COMBINE  2 HYDROGRAPHS AT         1
                                  ROUTE HYDROGRAPH TO               1
                                  END OF NETWORK

**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************

RUN  DATE  6/27/
     TIME  3 01 PM
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NATIONAL DAM INSPECTION PROGRAM, PHASE I REPORT, CORPS OF ENGINEERS NEW YORK DISTRICT
DAM INVENTORY NO. NY 349, NORWICH RESERVOIR NO. 2 DAM, CHENANGO COUNTY, NEW YORK, JUNE 27, 1981
PREPARED BY FLAHERTY GIAVARA ASSOCIATES, P.C., ONE COLUMBUS PLAZA, NEW HAVEN, CONNECTICUT

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
120	0	30	0	0	0	0	2	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS=	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH, SUB-WATERSHED NO. 1, SNYDER METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.09	0.00	3.78	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.20	111.00	122.00	133.00	143.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.01

UNIT HYDROGRAPH DATA
TP= 3.11 CP=0.63 NTA= 0

RECESSION DATA
STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.50

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 7.22 AND R= 5.49 INTERVALS

UNIT HYDROGRAPH 33 END-OF-PERIOD ORDINATES, LAG= 3.09 HOURS, CP= 0.64 VOL= 1.00

16	60	119	183	230	271	278	254	213	178
148	123	103	86	71	59	49	41	34	29
24	20	16	14	11	10	8	7	6	5
4	3	3							

0 END-OF-PERIOD FLOW

MO	DA	HR	MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO	DA	HR	MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1	01	0	30	1	0.01	0.00	0.01	4	1	02	6	30	61	0.19	0.14	0.05	59
1	01	1	00	2	0.01	0.00	0.01	4	1	02	7	00	62	0.19	0.14	0.05	68
1	01	1	30	3	0.01	0.00	0.01	4	1	02	7	30	63	0.19	0.14	0.05	82
1	01	2	00	4	0.01	0.00	0.01	4	1	02	8	00	64	0.19	0.14	0.05	103

1	01	2	30	5	0	01	0	00	0	01	3	1	02	8	30	65	0	19	0	14	0	05	130
1	01	3	00	6	0	01	0	00	0	01	3	1	02	9	00	66	0	19	0	14	0	05	160
1	01	3	30	7	0	01	0	00	0	01	3	1	02	9	30	67	0	19	0	14	0	05	192
1	01	4	00	8	0	01	0	00	0	01	3	1	02	10	00	68	0	19	0	14	0	05	221
1	01	4	30	9	0	01	0	00	0	01	3	1	02	10	30	69	0	19	0	14	0	05	245
1	01	5	00	10	0	01	0	00	0	01	3	1	02	11	00	70	0	19	0	14	0	05	265
1	01	5	30	11	0	01	0	00	0	01	3	1	02	11	30	71	0	19	0	14	0	05	282
1	01	6	00	12	0	01	0	00	0	01	3	1	02	12	00	72	0	19	0	14	0	05	296
1	01	6	30	13	0	01	0	00	0	01	3	1	02	12	30	73	1	12	1	07	0	05	323
1	01	7	00	14	0	01	0	00	0	01	2	1	02	13	00	74	1	12	1	07	0	05	389
1	01	7	30	15	0	01	0	00	0	01	2	1	02	13	30	75	1	35	1	30	0	05	512
1	01	8	00	16	0	01	0	00	0	01	2	1	02	14	00	76	1	35	1	30	0	05	703
1	01	8	30	17	0	01	0	00	0	01	2	1	02	14	30	77	1	68	1	63	0	05	964
1	01	9	00	18	0	01	0	00	0	01	2	1	02	15	00	78	1	68	1	63	0	05	1283
1	01	9	30	19	0	01	0	00	0	01	2	1	02	15	30	79	2	04	2	00	0	05	1647
1	01	10	00	20	0	01	0	00	0	01	2	1	02	16	00	80	6	48	6	43	0	05	2105
1	01	10	30	21	0	01	0	00	0	01	2	1	02	16	30	81	1	57	1	52	0	05	2678
1	01	11	00	22	0	01	0	00	0	01	2	1	02	17	00	82	1	57	1	52	0	05	3293
1	01	11	30	23	0	01	0	00	0	01	2	1	02	17	30	83	1	23	1	18	0	05	3883
1	01	12	00	24	0	01	0	00	0	01	2	1	02	18	00	84	1	23	1	18	0	05	4360
1	01	12	30	25	0	08	0	00	0	08	2	1	02	18	30	85	0	11	0	06	0	05	4638
1	01	13	00	26	0	08	0	00	0	08	2	1	02	19	00	86	0	11	0	06	0	05	4674
1	01	13	30	27	0	10	0	00	0	10	2	1	02	19	30	87	0	11	0	06	0	05	4438
1	01	14	00	28	0	10	0	00	0	10	2	1	02	20	00	88	0	11	0	06	0	05	4022
1	01	14	30	29	0	13	0	00	0	13	2	1	02	20	30	89	0	11	0	06	0	05	3554
1	01	15	00	30	0	13	0	00	0	13	2	1	02	21	00	90	0	11	0	06	0	05	3074
1	01	15	30	31	0	15	0	01	0	14	3	1	02	21	30	91	0	11	0	06	0	05	2615
1	01	16	00	32	0	49	0	44	0	05	10	1	02	22	00	92	0	11	0	06	0	05	2208
1	01	16	30	33	0	12	0	07	0	05	31	1	02	22	30	93	0	11	0	06	0	05	1867
1	01	17	00	34	0	12	0	07	0	05	61	1	02	23	00	94	0	11	0	06	0	05	1582
1	01	17	30	35	0	09	0	04	0	05	97	1	02	23	30	95	0	11	0	06	0	05	1345
1	01	18	00	36	0	09	0	04	0	05	133	1	03	0	00	96	0	11	0	06	0	05	1148
1	01	18	30	37	0	01	0	00	0	01	160	1	03	0	30	97	0	00	0	00	0	00	983
1	01	19	00	38	0	01	0	00	0	01	174	1	03	1	00	98	0	00	0	00	0	00	842
1	01	19	30	39	0	01	0	00	0	01	170	1	03	1	30	99	0	00	0	00	0	00	721
1	01	20	00	40	0	01	0	00	0	01	155	1	03	2	00	100	0	00	0	00	0	00	614
1	01	20	30	41	0	01	0	00	0	01	136	1	03	2	30	101	0	00	0	00	0	00	521
1	01	21	00	42	0	01	0	00	0	01	117	1	03	3	00	102	0	00	0	00	0	00	461
1	01	21	30	43	0	01	0	00	0	01	98	1	03	3	30	103	0	00	0	00	0	00	443
1	01	22	00	44	0	01	0	00	0	01	80	1	03	4	00	104	0	00	0	00	0	00	425
1	01	22	30	45	0	01	0	00	0	01	69	1	03	4	30	105	0	00	0	00	0	00	408
1	01	23	00	46	0	01	0	00	0	01	57	1	03	5	00	106	0	00	0	00	0	00	392
1	01	23	30	47	0	01	0	00	0	01	48	1	03	5	30	107	0	00	0	00	0	00	376
1	02	0	00	48	0	01	0	00	0	01	40	1	03	6	00	108	0	00	0	00	0	00	361
1	02	0	30	49	0	07	0	02	0	05	34	1	03	6	30	109	0	00	0	00	0	00	347
1	02	1	00	50	0	07	0	02	0	05	30	1	03	7	00	110	0	00	0	00	0	00	333
1	02	1	30	51	0	07	0	02	0	05	28	1	03	7	30	111	0	00	0	00	0	00	320
1	02	2	00	52	0	07	0	02	0	05	29	1	03	8	00	112	0	00	0	00	0	00	307
1	02	2	30	53	0	07	0	02	0	05	31	1	03	8	30	113	0	00	0	00	0	00	295
1	02	3	00	54	0	07	0	02	0	05	35	1	03	9	00	114	0	00	0	00	0	00	283
1	02	3	30	55	0	07	0	02	0	05	40	1	03	9	30	115	0	00	0	00	0	00	272
1	02	4	00	56	0	07	0	02	0	05	44	1	03	10	00	116	0	00	0	00	0	00	261
1	02	4	30	57	0	07	0	02	0	05	48	1	03	10	30	117	0	00	0	00	0	00	251
1	02	5	00	58	0	07	0	02	0	05	51	1	03	11	00	118	0	00	0	00	0	00	241
1	02	5	30	59	0	07	0	02	0	05	54	1	03	11	30	119	0	00	0	00	0	00	231
1	02	6	00	60	0	07	0	02	0	05	56	1	03	12	00	120	0	00	0	00	0	00	222
																SUM	28	89	25	17	3	72	71516

(734)(639)(94)(2025 11)

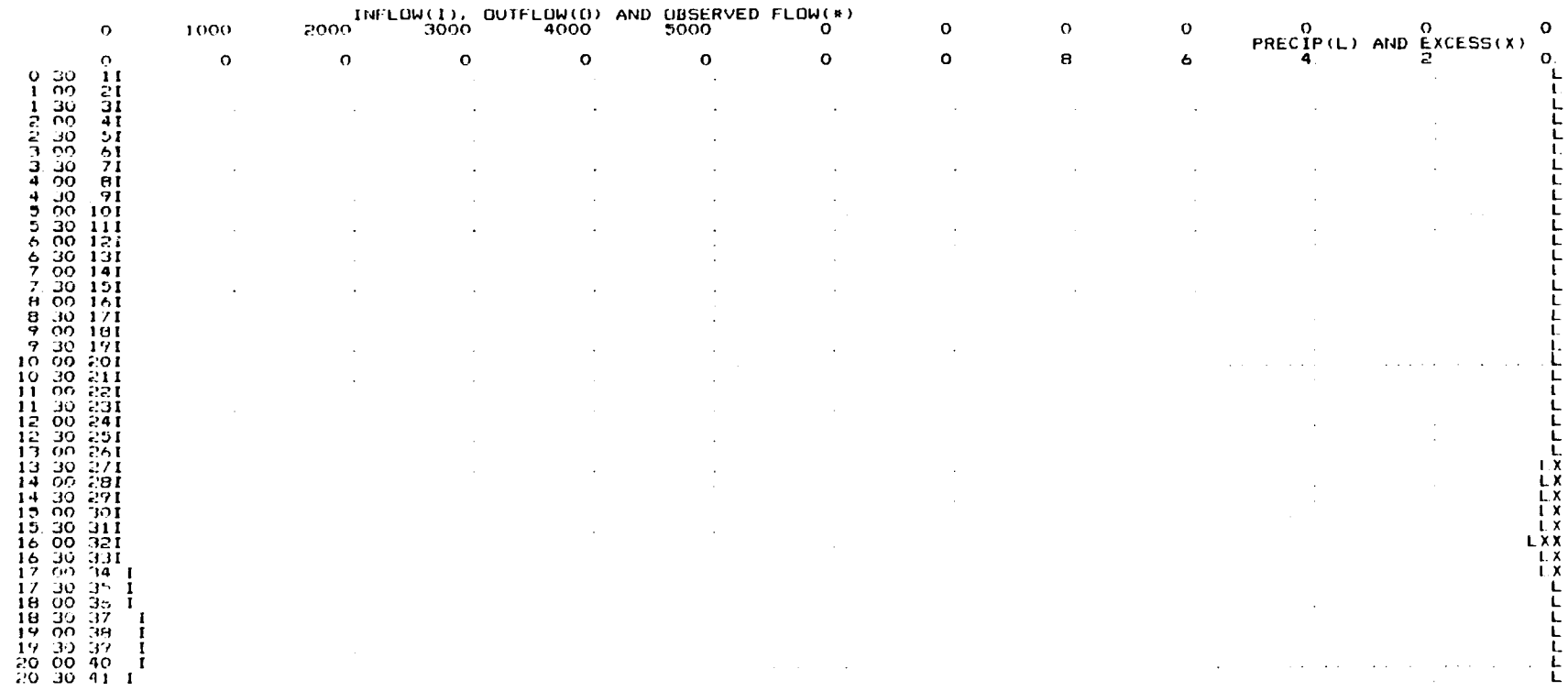
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4674	3616	1403	595	71405
CMS	132	102	40	17	2022
INCHES		16 09	24 98	26 48	26 48
MM		408 75	634 62	672 70	672 70
AC-FT		1793	2784	2951	2951
THOUS CU M		2211	3433	3640	3640

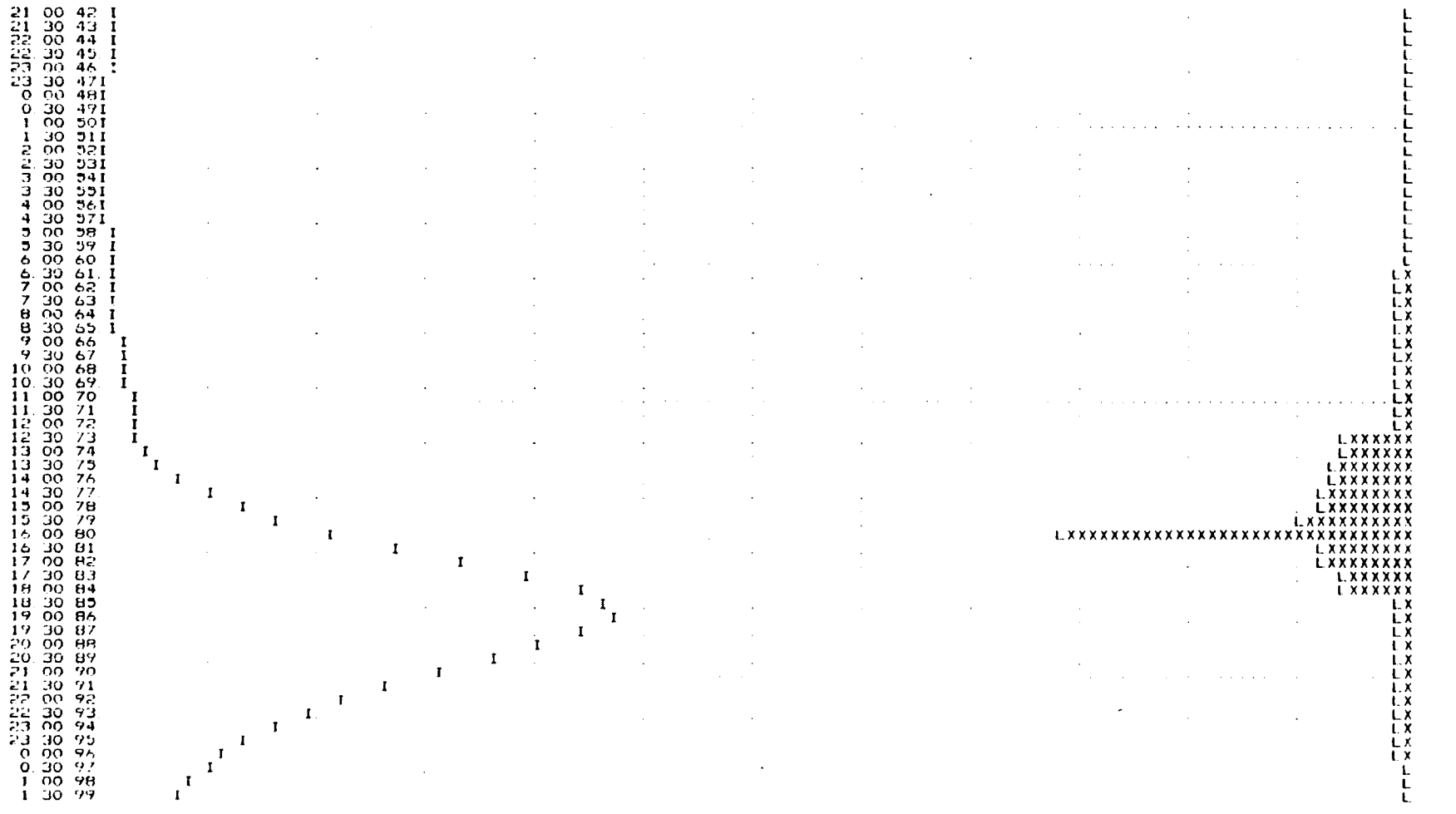
1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

PRECIP(L) AND EXCESS(X)

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21 30 43
22 00 44
22 30 45
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0 30 49
1 00 50
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2 30 53
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3 30 55
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6 30 61
7 00 62
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8 00 64
8 30 65
9 00 66
9 30 67
10 00 68
10 30 69
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13 00 74
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14 30 77
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16 30 81
17 00 82
17 30 83
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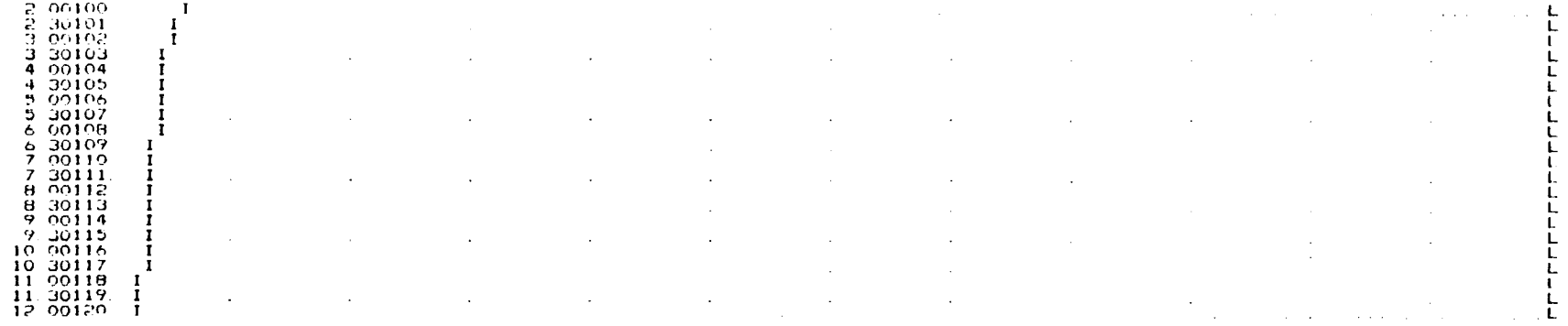
1 00 98
1 30 99



1*OVN*

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	1	3	6	10	13	16	17	17	15
14	12	10	8	7	6	5	4	3	3
3	3	3	4	4	4	5	5	5	6
6	7	8	10	13	16	19	22	24	27
28	30	32	39	51	70	96	128	165	210
268	329	388	436	464	467	444	402	355	307
262	221	187	158	135	115	98	84	72	61
52	46	44	42	41	39	38	36	35	33
32	31	30	28	27	26	25	24	23	22

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	467	362	140	60	7140
CMS	13	10	4	2	202
INCHES		1 61	2 30	2 65	2 65
MM		40 88	63 46	67 27	67 27
AC-FT		179	278	295	295
THOUS CU M		221	343	364	364

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

1	1	1	1	1	1	1	1	1	1
1	1	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
1	2	6	12	19	27	32	35	34	31
27	23	20	16	14	11	10	8	7	6
6	6	6	7	8	9	10	10	11	11
12	14	16	21	26	32	38	44	49	53
56	59	65	78	102	141	193	257	329	421

536	659	777	872	928	935	888	804	711	615
523	442	373	316	269	230	197	168	144	123
104	92	89	85	82	78	75	72	69	67
64.	61.	59.	57.	54.	52.	50.	48	46	44

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	935	723	281.	119.	14281
CMS	26.	20.	8.	3.	404.
INCHES		3.22	5 00	5 30	5 30
MM		81.75	126.92	134.54	134 54
AC-FT		359	557.	590	590
THOUS CU M		442.	687.	728.	728

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1	1
1	1	1	1.	1.	1	1	1	1	1.
1	1.	1.	1	1	1.	1	1	1	1
1	3.	9.	18.	29.	40.	48.	52	51.	46.
41.	35.	30.	25.	21.	17.	14.	12.	10.	9.
8	9.	9.	11.	12.	13.	14.	15.	16.	17.
18	20.	25	31.	39.	48.	58.	66	73	80.
85	89	97	117	154.	211	289	385	494	631
803.	988.	1165.	1308.	1391.	1402.	1332.	1207	1066.	922
785	662	560	475	404	344	295.	253	216	184
156	138	133	127.	122	118	113.	108	104	100
96	92	89	85	82	78	75	72	69	67

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1402.	1085	421.	179	21421
CMS	40.	31	12	5.	607
INCHES		4.83	7.50	7.93	7.93
MM		122.63	190.39	201.81	201.81
AC-FT		538.	835.	885.	885.
THOUS CU M		663	1030	1092	1092

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

2	2	1	1	1	1	1	1	1	1
1.	1.	1.	1.	1	1.	1.	1	1.	1.
1	1	1	1	1	1.	1	1	1	1
1	4.	12	25.	39.	53	64	69	68	62.
54	47	39	33.	27	23	19	16	14.	12.
11.	12.	13.	14.	16.	18.	19.	20.	21.	22.
24.	27.	33.	41.	52.	64.	77.	88.	98.	106.
113	118	129	156	205	281.	386.	513	659.	842.
1071	1317	1553	1744	1855	1870	1775	1609	1421	1230.
1046.	883	747.	633	538.	459.	393.	337.	288.	246.
208	184	177	170	163	157	151	145	139	133.
128	123.	118	113	109.	104	100	96	93	89.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1870	1446	561	238	28562
CMS	53	41	16	7	809
INCHES		6 44	9 99	10 59	10 59
MM		163.50	253.85	269.08	269 08
AC-FT		717	1113	1180	1180
THOUS CU M		885	1373	1456	1456

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
1	3	16	31	49	66	80	87	85	77
60	55	49	41	34	29	24	20	17	15
14	14	16	18	20	22	24	26	27	28
30	34	41	50	65	80	96	110	122	133
141	148	161	194	256	352	482	642	823	1052
1337	1647	1942	2180	2319	2337	2219	2011	1777	1537
1308	1104	933	791	673	574	491	421	360	307
260	230	221	212	204	196	188	181	173	167
160	154	148	142	136	131	125	120	116	111

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2337	1808	702	298	35702
CMS	66	51	20	8	1011
INCHES		8 05	12 49	13 24	13 24
MM		204 38	317 31	336 35	336 35
AC FT		896	1392	1475	1475
THOUS CU M		1106	1717	1820	1820

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
6	14	37	58	80	96	104	102	93
80	70	59	49	41	34	29	24	20	18
17	17	17	21	24	27	29	31	32	33
36	41	49	62	78	96	115	132	147	159
169	178	194	233	307	422	578	770	988	1263
1607	1976	2330	2616	2783	2804	2663	2413	2132	1844
1559	1325	1120	949	807	689	590	505	432	369
312	276	255	245	235	226	217	208	200
192	184	177	170	163	157	151	145	139	133

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2804	2169	842	357	42843
CMS	79	61	24	10	1213
INCHES		9 66	14 99	15 89	15 89
MM		245 25	380 77	403 62	403 62
AC FT		1076	1670	1770	1770
THOUS CU M		1327	2060	2184	2184

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

3	3	3	3	2	2	2	2	2
2	2	2	2	2	2	2	2	1
1	1	1	1	1	1	1	1	2
7	7	22	43	68	93	112	122	119	108
95	85	69	58	48	40	33	28	24	21
30	30	30	35	28	31	34	36	38	39
43	47	55	73	91	112	134	154	171	186
197	207	226	272	358	492	675	898	1153	1473
1873	2307	2719	3052	3247	3272	3107	2816	2488	2152

1831	1545	1307	1108	942	804	688	589	504	430
364	323	310	297	286	274	263	253	243	233
224	215	207	198	190	183	176	169	162	155

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3272	2531	982	417	49783
CMS	93	72	28	12	1415
INCHES		11 26	17 49	18 54	18 54
MM		286 13	444 23	470 89	470 89
AC-FT		1255	1948	2065	2065
THOUS CU M		1548	2403	2548	2548

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

3	3	3	3	3	3	3	2	2	2
2	2	2	2	2	2	2	2	2	2
2	2	2	1	1	1	1	2	2	2
2	8	25	49	78	106	128	139	136	124
109	93	79	66	55	46	38	32	27	24
22	23	25	28	32	36	38	41	43	45
48	54	66	83	104	128	154	177	196	212
226	237	258	311	410	563	771	1027	1318	1684
2143	2635	3106	3488	3711	3739	3551	3218	2843	2459
2092	1766	1493	1266	1076	918	786	674	577	492
417	369	354	340	326	313	301	289	278	267
256	246	236	227	218	209	201	193	185	178

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3739	2892	1123	476	57124
CMS	106	82	32	13	1618
INCHES		12 87	19 99	21 19	21 19
MM		327 00	507 69	538 16	538 16
AC-FT		1434	2227	2360	2360
THOUS CU M		1769	2747	2912	2912

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

4	4	4	4	3	3	3	3	3	3
3	3	3	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2
3	10	31	61	97	133	160	174	170	155
136	117	98	82	69	57	48	40	34	30
28	29	31	35	40	44	48	51	54	56
59	68	82	103	130	160	192	221	245	265
282	296	323	389	512	703	964	1283	1647	2105
2678	3293	3883	4360	4638	4674	4438	4022	3554	3074
2615	2208	1867	1582	1345	1148	983	842	721	614
521	461	443	425	408	392	376	361	347	333
320	307	295	283	272	261	251	241	231	222

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4674	3616	1403	595	71405
CMS	132	102	40	17	2022
INCHES		16 09	24 98	26 48	26 48
MM		408 75	634 62	672 70	672 70
AC-FT		1793	2784	2951	2951
THOUS CU M		2211	3433	3640	3640

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH SUB WATERSHED NO 2. SNYDER METHOD

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.69	0.00	3.78	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.20	111.00	122.00	133.00	143.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOK	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.01

UNIT HYDROGRAPH DATA

TP= 2.97 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.50

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.80 AND R= 5.29 INTERVALS

UNIT HYDROGRAPH 32 END-OF-PERIOD ORDINATES. LAG= 2.97 HOURS, CP= 0.63 VOL= 1.00

15.	55.	108.	165.	211.	234.	230.	201.	166.	137.
114.	94.	78.	64.	53.	44.	36.	30.	25.	21.
17.	14.	12.	10.	8.	7.	5.	5.	4.	3.
3.	2.								

END-OF-PERIOD FLOW

MO	DA	HR	MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO	DA	HR	MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1	01	0	30	1	0.01	0.01	0.00	3	1	02	6	30	61	0.19	0.19	0.00	143.
1	01	1	00	2	0.01	0.01	0.00	4	1	02	7	00	62	0.19	0.19	0.00	152.
1	01	1	30	3	0.01	0.01	0.00	4	1	02	7	30	63	0.19	0.19	0.00	167.
1	01	2	00	4	0.01	0.01	0.00	5	1	02	8	00	64	0.19	0.19	0.00	187.
1	01	2	30	5	0.01	0.01	0.00	6	1	02	8	30	65	0.19	0.19	0.00	212.
1	01	3	00	6	0.01	0.01	0.00	7	1	02	9	00	66	0.19	0.19	0.00	240.
1	01	3	30	7	0.01	0.01	0.00	8	1	02	9	30	67	0.19	0.19	0.00	267.
1	01	4	00	8	0.01	0.01	0.00	9	1	02	10	00	68	0.19	0.19	0.00	290.
1	01	4	30	9	0.01	0.01	0.00	10	1	02	10	30	69	0.19	0.19	0.00	310.
1	01	5	00	10	0.01	0.01	0.00	11	1	02	11	00	70	0.19	0.19	0.00	326.
1	01	5	30	11	0.01	0.01	0.00	11	1	02	11	30	71	0.19	0.19	0.00	340.
1	01	6	00	12	0.01	0.01	0.00	12	1	02	12	00	72	0.19	0.19	0.00	351.
1	01	6	30	13	0.01	0.01	0.00	12	1	02	12	30	73	1.12	1.12	0.00	374.
1	01	7	00	14	0.01	0.01	0.00	13	1	02	13	00	74	1.12	1.12	0.00	433.
1	01	7	30	15	0.01	0.01	0.00	14	1	02	13	30	75	1.35	1.35	0.00	544.
1	01	8	00	16	0.01	0.01	0.00	16	1	02	14	00	76	1.35	1.35	0.00	716.
1	01	8	30	17	0.01	0.01	0.00	17	1	02	14	30	77	1.68	1.68	0.00	947.
1	01	9	00	18	0.01	0.01	0.00	20	1	02	15	00	78	1.68	1.68	0.00	1225.
1	01	9	30	19	0.01	0.01	0.00	22	1	02	15	30	79	2.04	2.04	0.00	1532.
1	01	10	00	20	0.01	0.01	0.00	23	1	02	16	00	80	6.48	6.48	0.00	1916.

1	01	10	30	21	0	01	0	01	0	00	25	1	02	16	30	81	1	57	1	57	0	00	2405
1	01	11	00	22	0	01	0	01	0	00	26	1	02	17	00	82	1	57	1	57	0	00	2930
1	01	11	30	23	0	01	0	01	0	00	27	1	02	17	30	83	1	23	1	23	0	00	3423
1	01	12	00	24	0	01	0	01	0	00	28	1	02	18	00	84	1	23	1	23	0	00	3800
1	01	12	30	25	0	08	0	08	0	00	29	1	02	18	30	85	0	11	0	11	0	00	3988
1	01	13	00	26	0	08	0	08	0	00	34	1	02	19	00	86	0	11	0	11	0	00	3942
1	01	13	30	27	0	10	0	10	0	00	42	1	02	19	30	87	0	11	0	11	0	00	3679
1	01	14	00	28	0	10	0	10	0	00	55	1	02	20	00	88	0	11	0	11	0	00	3304
1	01	14	30	29	0	13	0	13	0	00	72	1	02	20	30	89	0	11	0	11	0	00	2898
1	01	15	00	30	0	13	0	13	0	00	93	1	02	21	00	90	0	11	0	11	0	00	2492
1	01	15	30	31	0	15	0	15	0	00	116	1	02	21	30	91	0	11	0	11	0	00	2116
1	01	16	00	32	0	49	0	49	0	00	145	1	02	22	00	92	0	11	0	11	0	00	1792
1	01	16	30	33	0	12	0	12	0	00	182	1	02	22	30	93	0	11	0	11	0	00	1524
1	01	17	00	34	0	12	0	12	0	00	221	1	02	23	00	94	0	11	0	11	0	00	1303
1	01	17	30	35	0	09	0	09	0	00	258	1	02	23	30	95	0	11	0	11	0	00	1119
1	01	18	00	36	0	09	0	09	0	00	286	1	03	0	00	96	0	11	0	11	0	00	967
1	01	18	30	37	0	01	0	01	0	00	301	1	03	0	30	97	0	00	0	00	0	00	840
1	01	19	00	38	0	01	0	01	0	00	297	1	03	1	00	98	0	00	0	00	0	00	730
1	01	19	30	39	0	01	0	01	0	00	277	1	03	1	30	99	0	00	0	00	0	00	632
1	01	20	00	40	0	01	0	01	0	00	249	1	03	2	00	100	0	00	0	00	0	00	543
1	01	20	30	41	0	01	0	01	0	00	219	1	03	2	30	101	0	00	0	00	0	00	461
1	01	21	00	42	0	01	0	01	0	00	188	1	03	3	00	102	0	00	0	00	0	00	396
1	01	21	30	43	0	01	0	01	0	00	160	1	03	3	30	103	0	00	0	00	0	00	380
1	01	22	00	44	0	01	0	01	0	00	135	1	03	4	00	104	0	00	0	00	0	00	365
1	01	22	30	45	0	01	0	01	0	00	115	1	03	4	30	105	0	00	0	00	0	00	351
1	01	23	00	46	0	01	0	01	0	00	98	1	03	5	00	106	0	00	0	00	0	00	337
1	01	23	30	47	0	01	0	01	0	00	85	1	03	5	30	107	0	00	0	00	0	00	323
1	02	0	00	48	0	01	0	01	0	00	73	1	03	6	00	108	0	00	0	00	0	00	311
1	02	0	30	49	0	07	0	07	0	00	65	1	03	6	30	109	0	00	0	00	0	00	298
1	02	1	00	50	0	07	0	07	0	00	61	1	03	7	00	110	0	00	0	00	0	00	286
1	02	1	30	51	0	07	0	07	0	00	61	1	03	7	30	111	0	00	0	00	0	00	275
1	02	2	00	52	0	07	0	07	0	00	67	1	03	8	00	112	0	00	0	00	0	00	264
1	02	2	30	53	0	07	0	07	0	00	76	1	03	8	30	113	0	00	0	00	0	00	254
1	02	3	00	54	0	07	0	07	0	00	88	1	03	9	00	114	0	00	0	00	0	00	243
1	02	3	30	55	0	07	0	07	0	00	100	1	03	9	30	115	0	00	0	00	0	00	234
1	02	4	00	56	0	07	0	07	0	00	110	1	03	10	00	116	0	00	0	00	0	00	225
1	02	4	30	57	0	07	0	07	0	00	119	1	03	10	30	117	0	00	0	00	0	00	216
1	02	5	00	58	0	07	0	07	0	00	126	1	03	11	00	118	0	00	0	00	0	00	207
1	02	5	30	59	0	07	0	07	0	00	132	1	03	11	30	119	0	00	0	00	0	00	199
1	02	6	00	60	0	07	0	07	0	00	137	1	03	12	00	120	0	00	0	00	0	00	191
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																	(734	) (| 734 |) (| 0 |) (| 1872 31)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3988	3069	1220	550	66020
CMS	113	87	35	16	1869
INCHES		16 89	26 85	30 28	30 28
MM		429 09	682 03	769 19	769 19
AC-FT		1522	2419	2728	2728
THOUS CU M		1877	2984	3365	3365

1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0 500 1000 1500 2000 2500 3000 3500 4000 0 0 0 0

PRECIP(L) AND EXCESS(X)


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1 30 3I
2 00 4I
2 30 5I
3 00 6I
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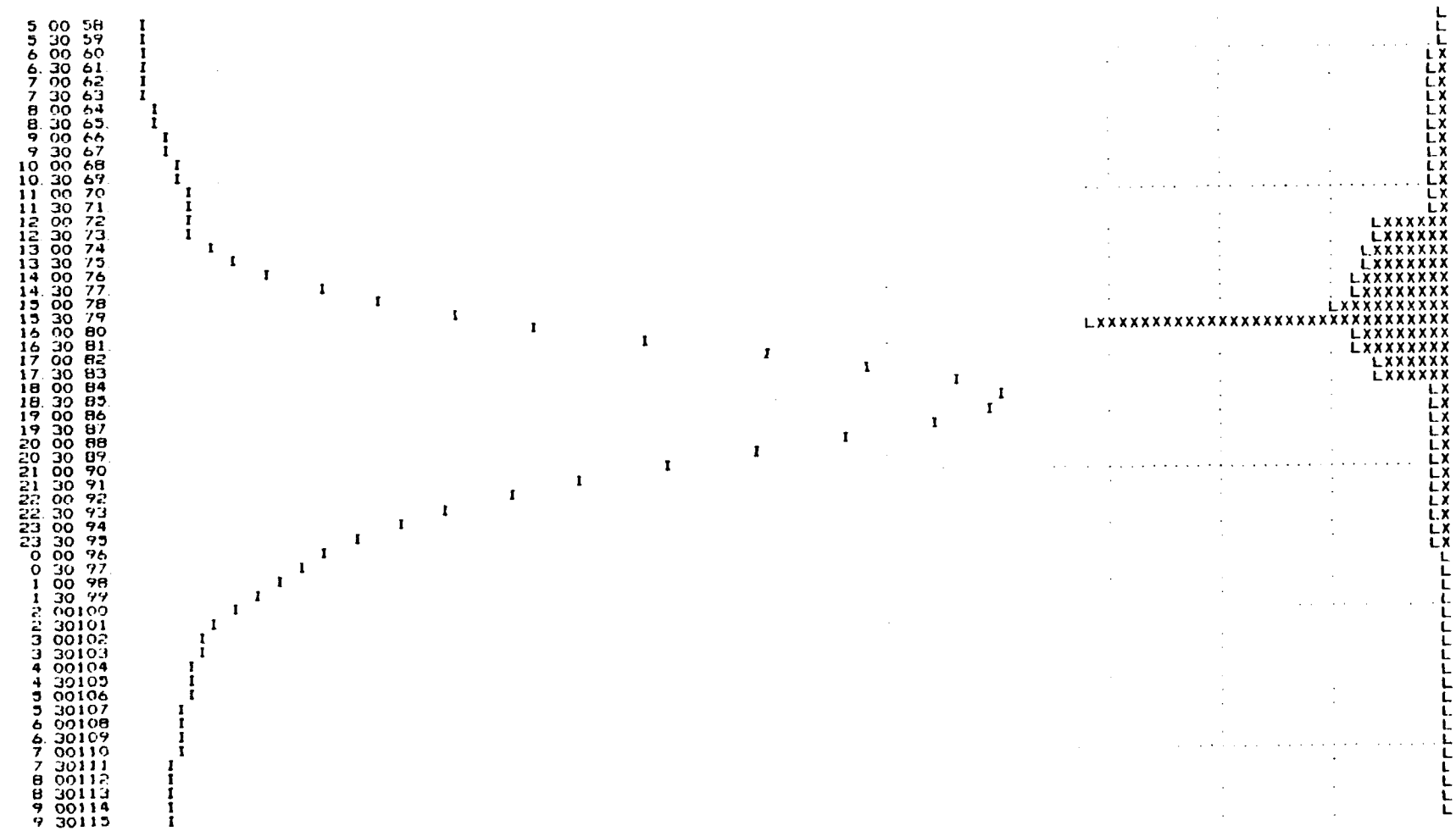

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 11 00119     1
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HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0	0	0	0	1	1	1	1	1	1
1	1	1	1	1	2	2	2	2	2
3	3	3	3	3	3	4	5	7	9
16	14	18	16	26	29	30	30	28	25
8	7	8	9	10	11	12	13	13	14
14	13	17	19	21	24	27	29	31	33
34	35	37	43	54	72	95	122	153	192
240	212	334	380	399	394	368	330	290	249
210	174	155	130	112	97	84	73	63	54
46	40	38	37	35	34	32	31	30	29
27	26	25	24	23	22	22	21	20	19

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	377	307	122	55	6602
CMS	11	9	3	2	187
INCHES		1 69	2 69	3 03	3 03
MM		42 91	68 20	76 92	76 92
AC-FT		152	242	273	273
THOUS CU M		188	298	337	337

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

1	1	1	1	1	1	2	2	2	2
3	3	3	3	3	3	3	4	4	5
6	5	6	6	6	7	8	11	14	19
44	38	35	44	32	37	60	59	55	50
12	11	10	27	23	20	17	15	13	12
28	30	33	37	26	22	24	25	26	27
68	70	75	87	42	48	53	58	62	65
481	586	685	760	109	143	189	245	306	383
423	358	305	261	798	788	736	661	580	498
92	79	76	73	224	193	168	146	126	109
55	53	51	49	70	67	65	62	60	57
				47	45	43	41	40	38

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	798	614	244	110	13204
CMS	23	17	7	3	374
INCHES		3 38	5 37	6 06	6 06
MM		85 82	136 41	153 84	153 84
AC-FT		304	484	546	546
THOUS CU M		375	597	673	673

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

1	1	1	1	2	2	2	3	3	3

3	4	4	4	4	5	5	6	6	7
7	8	8	8	9	10	13	16	22	28
35	43	55	66	77	86	90	89	83	75
66	56	48	41	35	30	25	22	19	18
18	20	23	26	30	33	36	38	40	41
43	46	50	56	64	72	80	87	93	98
102	105	112	130	163	215	284	367	459	575
721	879	1027	1140	1196	1183	1104	991	869	748
639	538	457	391	336	290	252	219	190	163
138	119	114	110	105	101	97	93	89	86
82	79	76	73	70	67	65	62	60	57

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1196	921	366	165	19806
CMS	34	26	10	5	561
INCHES		5 07	8 06	9 08	9 08
MM		128 73	204 61	230 76	230 76
AC-FT		457	726	818	818
THOUS CU M		563	895	1010	1010

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

1	1	2	2	2	3	3	4	4	4
5	5	5	5	6	6	7	8	9	9
10	10	11	11	12	13	17	22	29	37
46	58	73	88	103	115	120	119	111	100
87	75	64	54	46	39	34	29	26	24
24	27	30	35	40	44	48	51	53	55
57	61	67	75	85	96	107	116	124	130
136	140	150	173	218	286	379	490	613	767
962	1172	1369	1520	1595	1577	1471	1321	1159	997
846	717	610	521	448	387	336	292	253	217
184	158	152	146	140	135	129	124	119	115
110	106	101	97	94	90	86	83	80	76

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1595	1228	488	220	26408
CMS	45	35	14	6	748
INCHES		6 76	10 74	12 11	12 11
MM		171 64	272 81	307 68	307 68
AC-FT		609	968	1091	1091
THOUS CU M		751	1193	1346	1346

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

2	2	2	2	3	4	4	5	5	5
6	6	6	6	7	8	9	10	11	12
12	13	13	14	15	17	21	27	36	47
98	72	91	111	129	143	150	149	139	125
109	94	80	68	58	49	42	37	32	30
31	33	38	44	50	55	60	63	66	69
71	76	84	94	106	120	133	145	155	163
170	175	187	216	272	358	473	612	766	958
1202	1465	1712	1900	1994	1971	1839	1652	1449	1246
1058	896	762	651	560	484	420	365	316	271
230	198	190	183	175	168	162	155	149	143
137	132	127	122	117	112	108	104	99	95

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1994	1535	610	275	33010
CMS	56	43	17	8	935
INCHES		8.45	13.43	15.14	15.14
MM		214.55	341.01	384.59	384.59
AC-FT		761	1209.	1364	1364
THOUS CU M		939	1492	1683	1683

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

2	2	2	3	4	4	5	6	6	6
7	7	7	8	8	9	10	12	13	14
15	16	16	17	18	20	25	33	43	56
70	87	109	133	155	172	180	178	166	149
131	113	96	81	69	59	51	44	39	36
37	40	46	53	60	66	72	76	79	82
86	91	100	112	127	144	160	174	186	196
204	210	224	260	326	430	568	735	919	1150
1443	1758	2054	2280	2393	2365	2207	1982	1739	1495
1269	1075	915	782	672	580	504	438	379	326
276	238	228	219	210	202	194	186	179	172
165	158	152	146	140	135	129	124	119	115

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2393	1841	732	330	39612
CMS	68	52	21	9	1122
INCHES		10.14	16.11	18.17	18.17
MM		257.46	409.21	461.51	461.51
AC-FT		913	1451	1637	1637
THOUS CU M		1126	1790	2019	2019

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

2	2	3	3	4	5	6	6	7	8
8	8	9	9	10	11	12	14	15	16
17	18	19	19	21	24	29	38	51	65
81	101	127	155	181	201	210	208	194	174
153	132	112	95	81	69	59	51	45	42
43	47	53	61	70	77	83	88	93	96
100	107	117	131	149	168	187	203	217	228
238	245	262	303	381	501	663	857	1072	1341
1683	2051	2396	2660	2791	2759	2575	2313	2029	1744
1481	1254	1067	912	783	677	588	511	443	380
323	277	266	256	245	236	226	217	209	200
192	185	177	170	164	157	151	145	139	134

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2791	2148	854	385	46214
C S	79	61	24	11	1309
INC S		11.83	18.80	21.20	21.20
MM		300.36	477.42	538.43	538.43
AC-FT		1065	1693	1910	1910
THOUS CU M		1314	2089	2356	2356

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

		3	4	5	6	7	7	8	9
3	3	10	10	11	12	14	16	17	19
9	9								

20	21	21	22	23	27	34	44	58	74
93	116	145	177	207	229	240	238	222	199
175	150	128	108	92	79	68	59	52	48
49	53	61	70	80	88	95	101	106	110
114	122	134	150	170	192	214	232	248	261
272	281	299	346	435	573	757	980	1225	1533
1924	2344	2738	3040	3190	3154	2943	2643	2318	1994
1692	1434	1219	1042	895	774	672	584	506	434
369	317	304	292	281	269	259	248	239	229
220	211	203	195	187	180	172	166	159	153

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3190.	2455	976	440	52816
CMS	90	70	28	12	1496
INCHES		13 51	21 48	24 23	24 23
MM		343 27	545 62	615 35	615 35
AC-FT		1217	1935	2182	2182
THOUS CU M		1502	2387	2692	2692

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

3	4	4	5	6	7	8	9	10	11
11	12	12	13	14	16	17	20	22	23
25	26	27	28	29	34	42	55	72	93
116	145	182	221	258	286	301	297	277	249
219	188	160	135	115	98	85	73	65	61
61	67	76	88	100	110	119	126	132	137
143	152	167	187	212	240	267	290	310	326
340	351	374	433	544	716	947	1225	1532	1916
2405	2930	3423	3800	3988	3942	3679	3304	2898	2492
2116	1792	1524	1303	1119	967	840	730	632	543
461	396	380	365	351	337	323	311	298	286
275	264	254	243	234	225	216	207	199	191

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3988.	3069.	1220.	550.	66020.
CMS	113	87	35	16	1869.
INCHES		16 89	26 85	30 28	30 28
MM		429 09	682 03	769 19	769 19
AC-FT		1522	2419	2728	2728
THOUS CU M		1877	2984	3365	3365

********** ********** ********** ********** **********

COMBINE HYDROGRAPHS

INFLOW HYDROGRAPHS	SUB-WATERSHEDS NO 1 & NO 2 COMBINED							
ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	2	0	0	0	0	1	0	0

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 1

1	1	1	1	1	1	1	1	1
1	1	1	2	2	2	2	2	3
3	3	3	3	3	4	4	6	7	10

TIME 3 01 PM

12	16	21	28	36	42	46.	47.	45.	40.
35	30	26	22	18	16	13	11.	10.	9.
9	10	11	12	14	15	17.	18	19.	19
20	22	25	29	34	40	46	51.	55.	59.
62	65	70	82	106	142	191.	251.	318.	402.
508	622	731	816	863.	862	812.	733.	645.	557.
473	400	339	288	246	212	182	157	135.	116.
98	86	82	79	76.	73	70.	67.	65.	62.
59	57	55	53	51	49.	47.	45.	43.	41.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	863	668	262	115.	13742.
CMS	24	19	7	3.	389.
INCHES		1 65	2 58	2 82	2 82
MM		41 78	65 54	71 58	71 58
AC FT		331	520	568.	568.
THOUS CU M		409.	641.	700	700.

1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	100	200	300	400	500	600	700	800	900	0.	0.	0.
0	30	1I											
1	00	2I											
1	30	3I											
2	00	4I											
2	30	5I											
3	00	6I											
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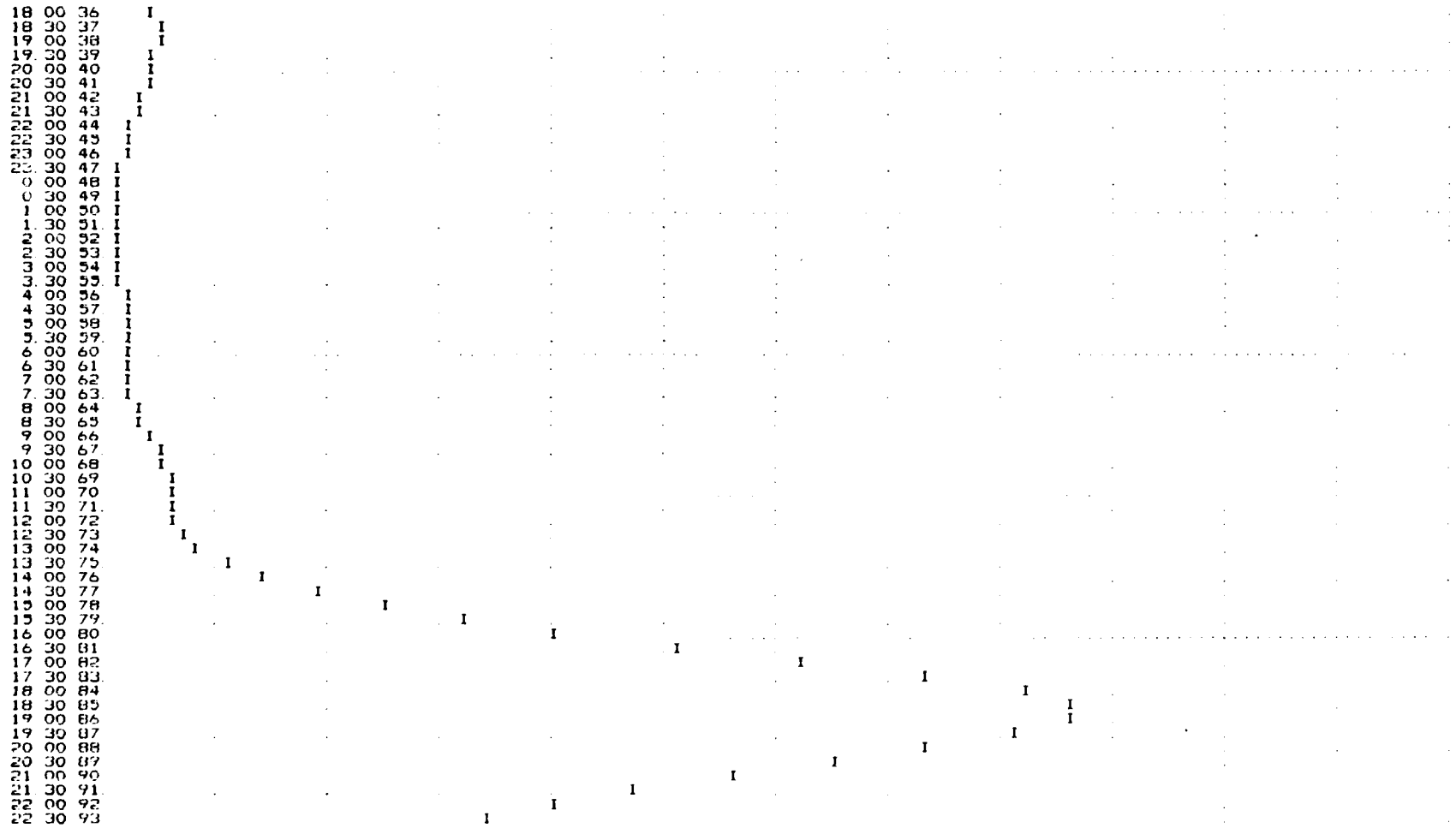
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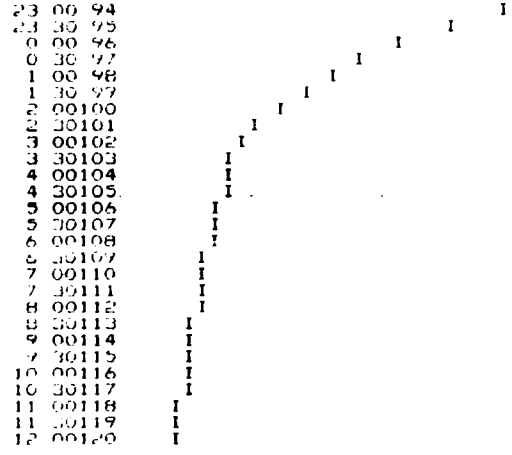
TIME 3 01 PM



1*QVN*

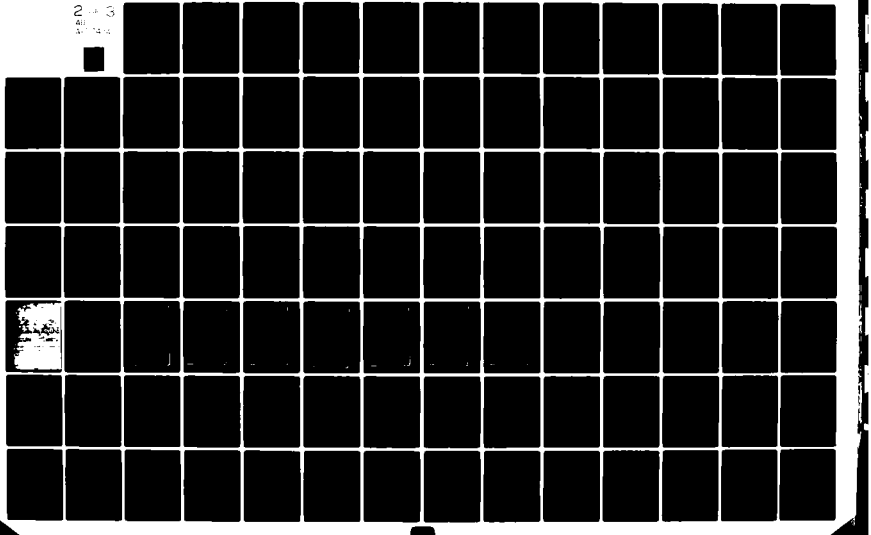
SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 2

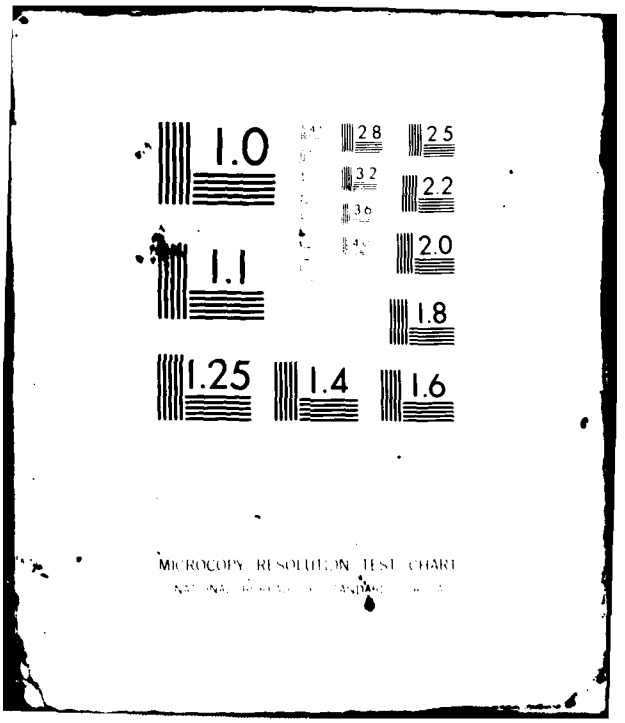
1	1	2	2	2	2	2	2	3	3
3	3	3	3	3	4	4	4	5	5
5	6	6	6	6	7	9	11	15	19
24	31	43	57	71	84	92	94	90	81
71	61	52	44	37	31	26	23	20	18
18	19	22	25	28	31	33	36	37	39
40	44	50	58	68	80	92	102	111	118
124	129	139	164	211	284	382	502	636	804
1017	1245	1461	1632	1725	1723	1623	1465	1290	1113
946	800	678	577	493	423	365	314	271	231
196	171	165	158	152	146	140	134	129	124
119	114	110	105	101	97	93	90	86	83

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1725.	1337.	524.	229.	27485.
CMS	49	38	15	6	778
INCHES		3 29	5 16	5 64	5 64
MM		83 57	131 07	143 17	143 17
AC-FT		663	1040	1136.	1136.
THOUS CU M		818	1283	1401	1401

STATION 1

AD-A107 414 FLAHERTY-GIAVARA ASSOCIATES NEW HAVEN CT F/G 13/13
NATIONAL DAM SAFETY PROGRAM. NORWICH RESERVOIR NUMBER 2 DAM (IN--ETC(U)
AUG 81 H C FLAHERTY DACW51-81-C-0006
UNCLASSIFIED NL

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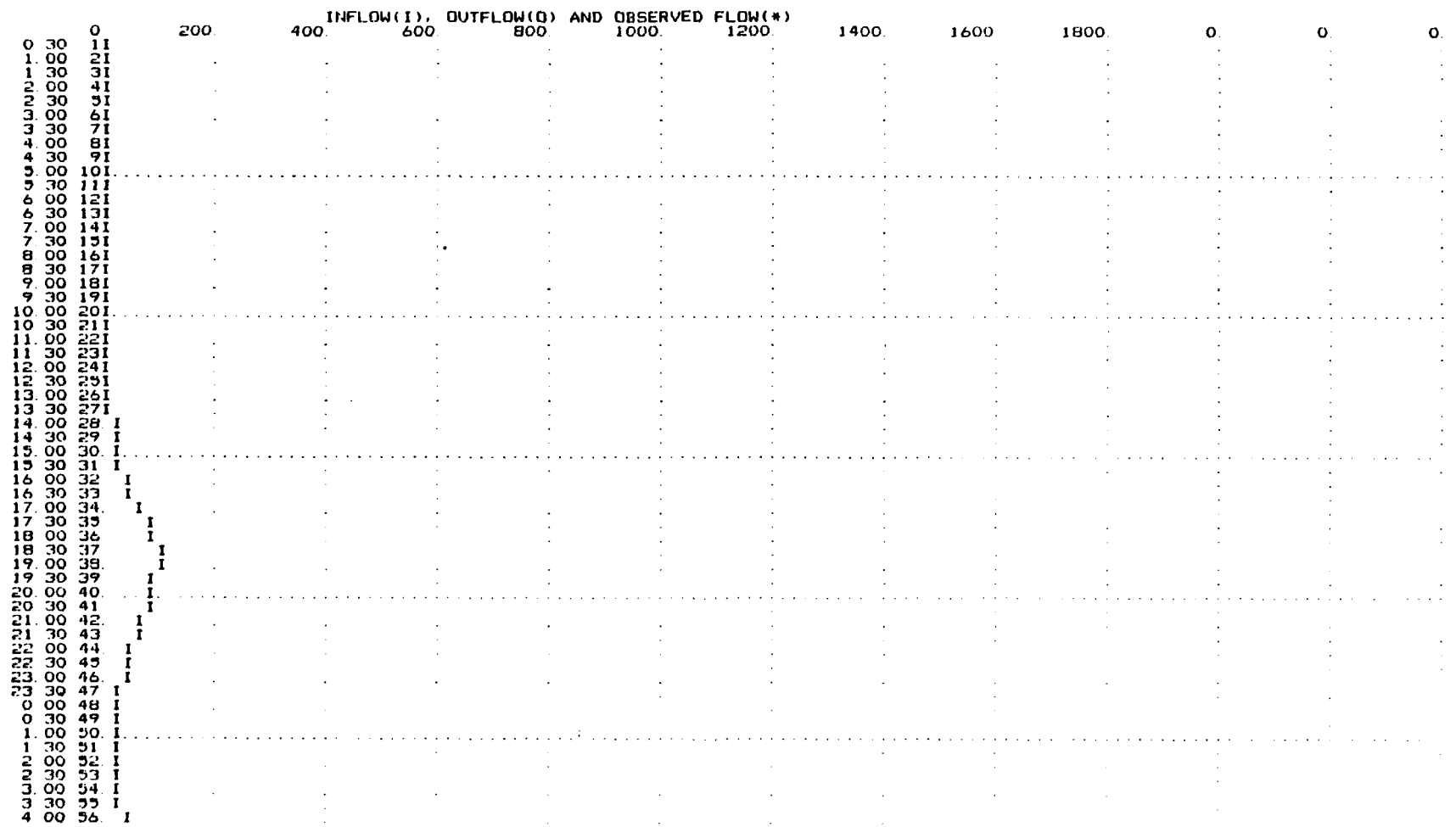
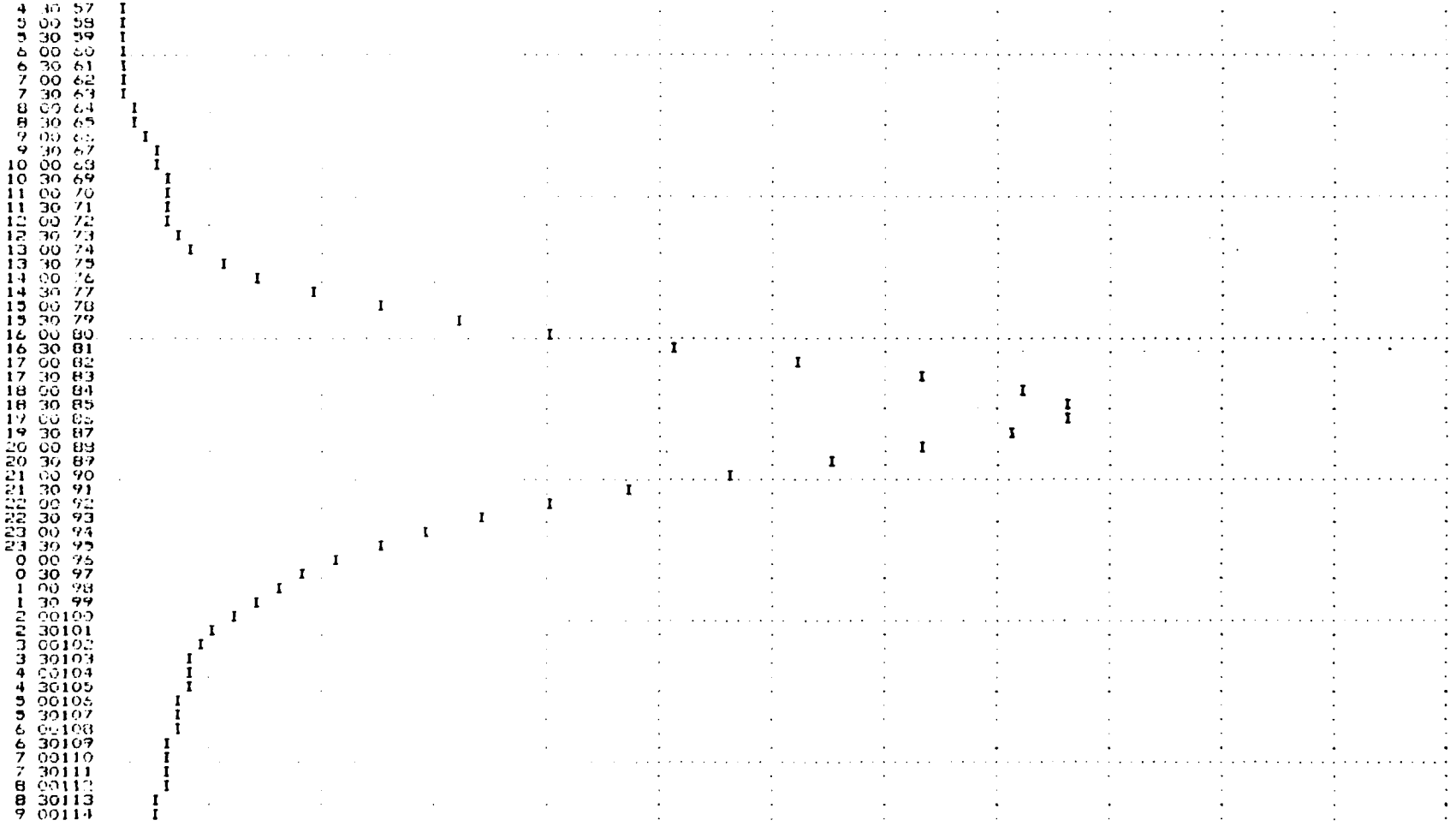
MICROCOPY RESOLUTION TEST CHART



RUN DATE 6/27/
TIME 3 01 PM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3 30103
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4 30105
5 00106
5 30107
6 00108
6 30109
7 00110
7 30111
8 00112
8 30113
9 00114

```
 9 30115      I
10 00116.     I
10 30117      I
11 00118.   I
11 30119    I
12 00120....I.....
```

1*OVN*

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 3

2.	2.	2.	3.	3.	3	3	4.	4.	4.
4	4	4	5	5	5	6	7	7	8
8.	8.	9.	9.	9.	11.	13	17.	22.	29.
36	47.	64	85.	107.	126	138	141	134.	121.
106.	91.	77.	65	55.	47	40.	34.	30	27.
27	29	32	37	42.	46.	50	53	56	58.
61.	66.	75.	87.	103.	120.	138.	153.	166.	177.
186	194	209	247	317	426	573	752	954	1206.
1525.	1867.	2192.	2448.	2588.	2585.	2435.	2198.	1936	1670.
1419	1200	1017.	865	739.	635.	547	472.	406	347.
294.	257.	247.	237.	228.	219.	210.	202.	194.	186.
178	171	165	158	152.	146.	140.	134.	129.	124.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2588.	2005.	786.	344.	41227.
CMS	73.	57.	22.	10.	1167.
INCHES		4.94	7.74	8.45	8.45
MM		125.35	196.61	214.75	214.75
AC-FT		994.	1560.	1704.	1704.
THOUS CU M		1227.	1924.	2101.	2101.

1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

```
        0        400       800       1200      1600      2000      2400      2800.     0     0     0     0     0
 0 30  1I
 1 00  2I
 1 30  3I
 2 00  4I
 2 30  5I
 3 00  6I
 3 30  7I
 4 00  8I
 4 30  9I
 5 00 10I
 5 30 11I
 6 00 12I
 6 30 13I
 7 00 14I
 7 30 15I
 8 00 16I
 8 30 17I
 9 00 18I
 9 30 19I
```

****

RUN DATE 6/27/
TIME 3 01 PM


10 00 20
10 30 21
11 00 22
11 30 23
12 00 24
12 30 25
13 00 26
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14 00 28
14 30 29
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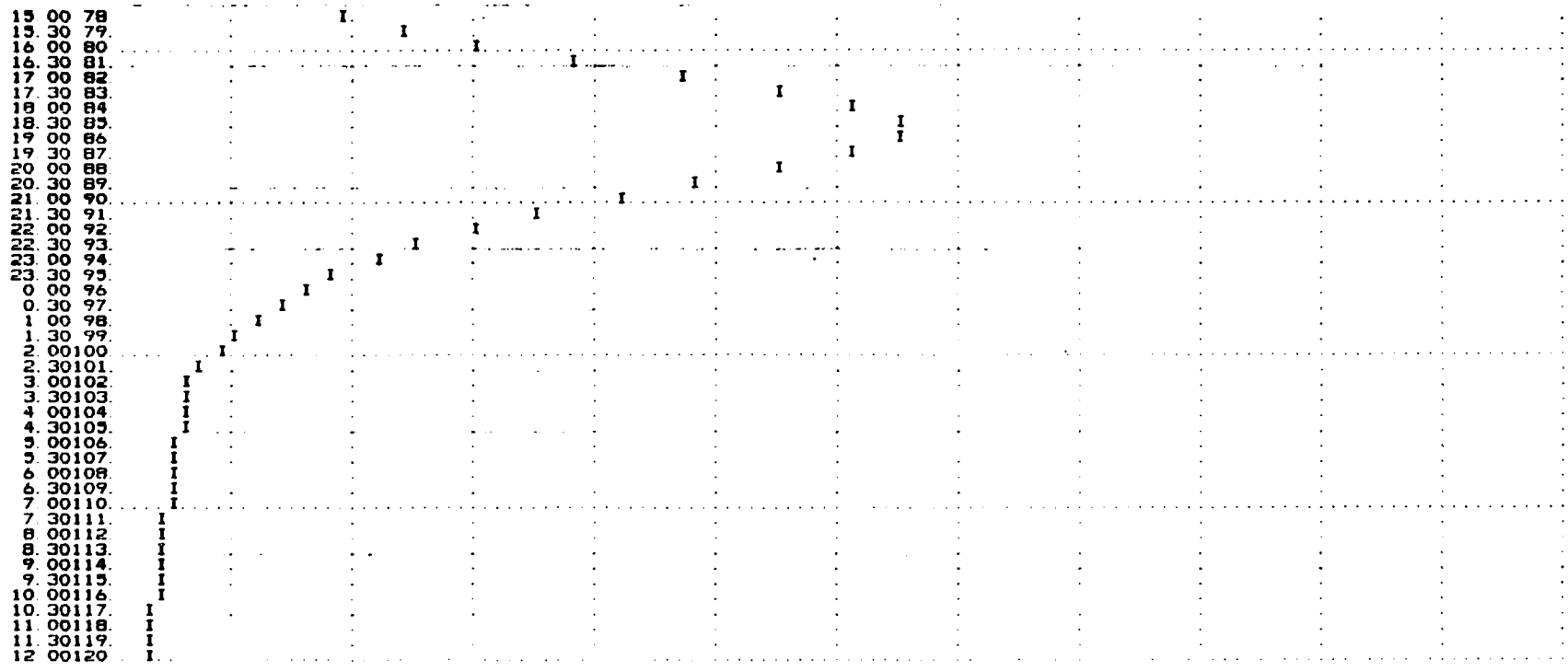


1*OVN*

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 4

3.	3.	3.	3.	4.	4.	5.	5.	5.	5.
6.	6.	6.	6.	7.	7.	8.	9.	9.	10.
11.	11.	11.	12.	12.	14.	18.	23.	30.	38.
47.	62.	85	113.	142.	168.	184.	188	179.	162.
142	122	103	87	73.	62.	53	45	39.	36.
36.	38.	43.	49.	56.	62.	67.	71	74.	77.
81.	88	100	116	137	160	184	204	222.	236.
249	259.	279.	329.	422.	568.	764	1003.	1271.	1608.

****

RUN DATE 6/27/
TIME 3:01 PM

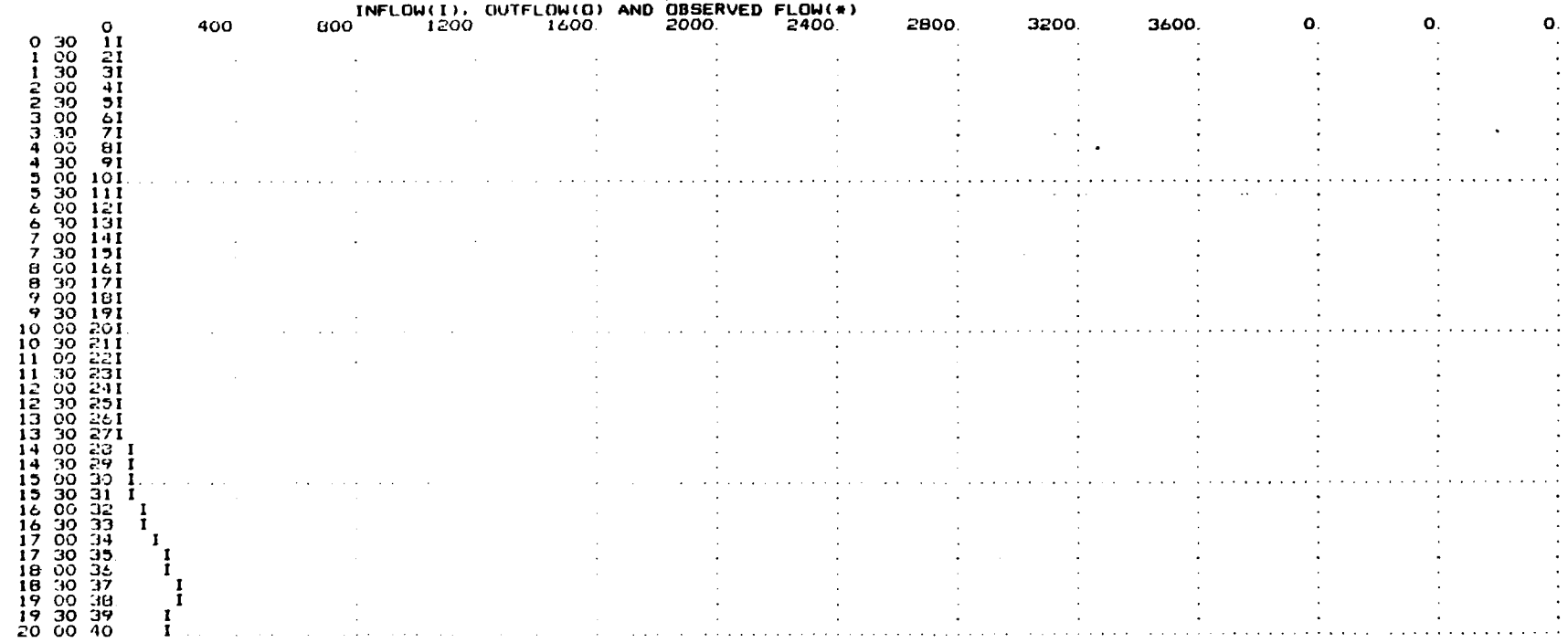
2033	2489	2922	3264	3450	3446	3247	2930	2581	2226
1892	1600	1356	1154	986	846	729	629	541	463
393	343	329	316	303	291	280	269	258	248
238	229	219	211	202	194	187	179	172	165

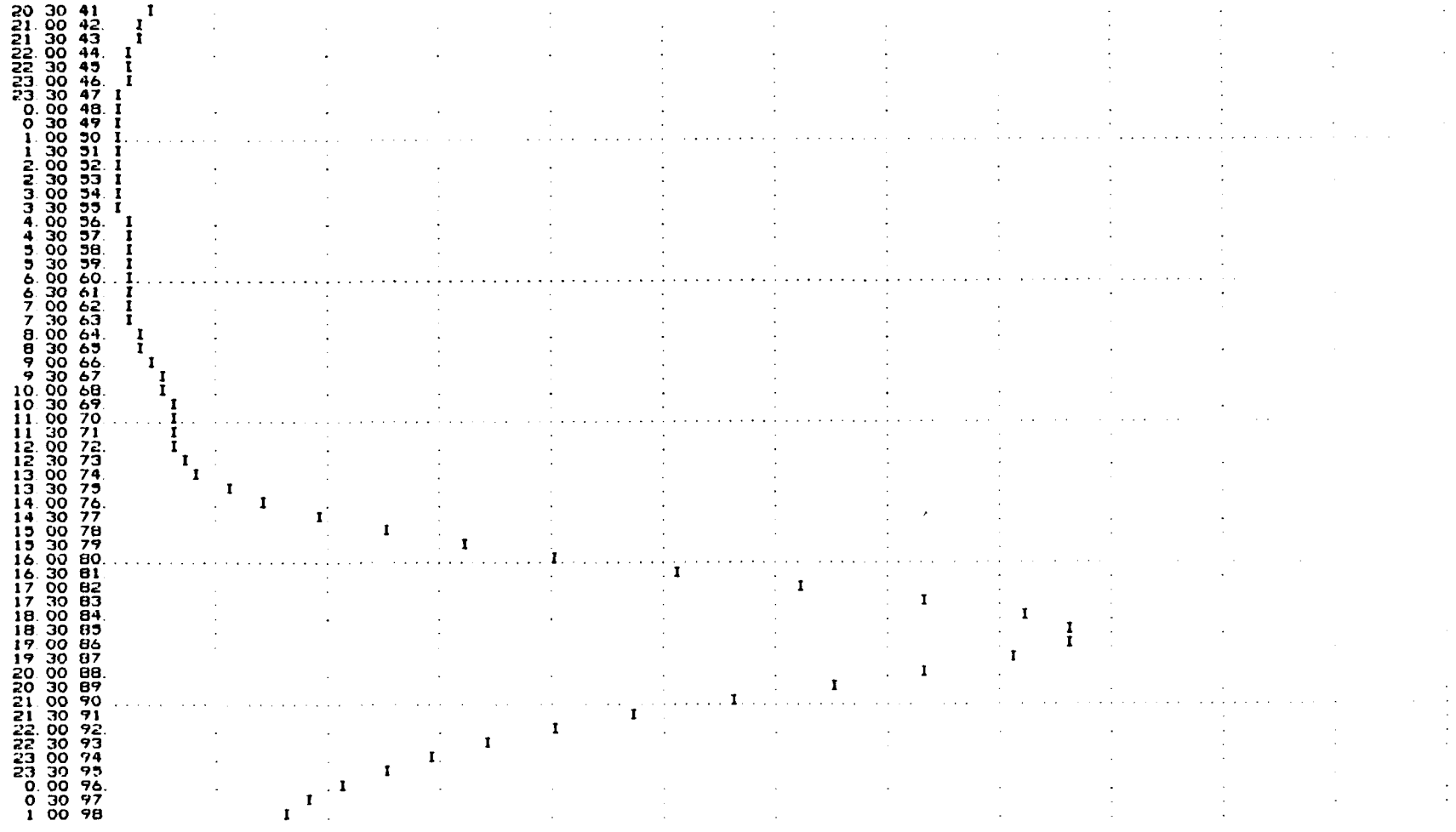
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3450	2674	1048	458	54970
CMS	98	76	30	13	1557
INCHES		6.58	10.32	11.27	11.27
MM		167.14	262.14	286.34	286.34
AC-FT		1326	2080	2271	2271
THOUS CU M		1635	2565	2802	2802

1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

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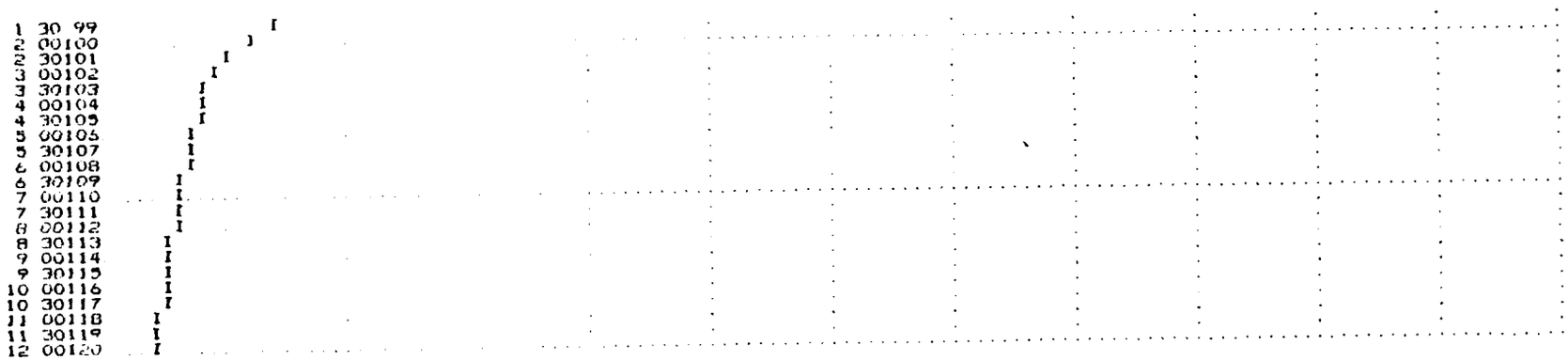

1*DVN*

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 5

4	4	4	4	5.	5	6.	6.	7.	7.
7	7	7	8	8	9	10.	11.	12.	13.
13	14	14	15.	16.	18.	22.	28.	37.	48.
59	78	106	141	178.	210	230.	235.	224.	202.
177	152	129	109	92.	78	66.	57	49.	45.
45	48	54	62	70	77	84.	89.	93.	97.
101	110	124	145.	171.	200.	229.	256.	277.	296.
311	323	348	411	528.	710.	955.	1254.	1589.	2010.
2542	3111	3653	4080	4313.	4308.	4059.	3663.	3226.	2783.
2365	2000	1695	1442	1232	1058	911.	786.	677.	579.
491	428	411	395.	379.	364	350.	336.	323.	310.
297	286	274	263.	253.	243.	233.	224.	215.	207.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4313	3342.	1311.	573.	68712.
CMS	122	95.	37.	16.	1946.
INCHES		8.23	12.90	14.09	14.09
MM		208.92	327.68	357.92	357.92
AC-FT		1657	2599.	2839.	2839.
THOUS CU M		2044.	3206.	3502.	3502.

1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	400	800	1200	1600	2000.	2400.	2800	3200.	3600.	4000.	4400.	0.
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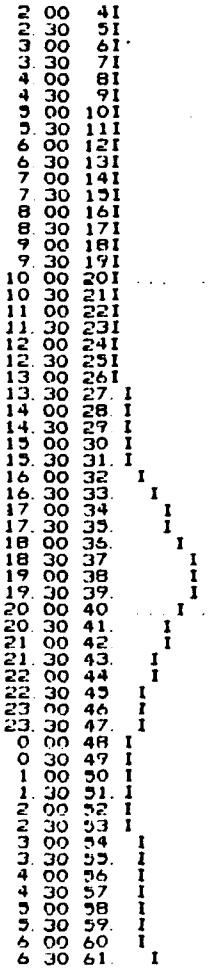
1	00	21											
1	30	31											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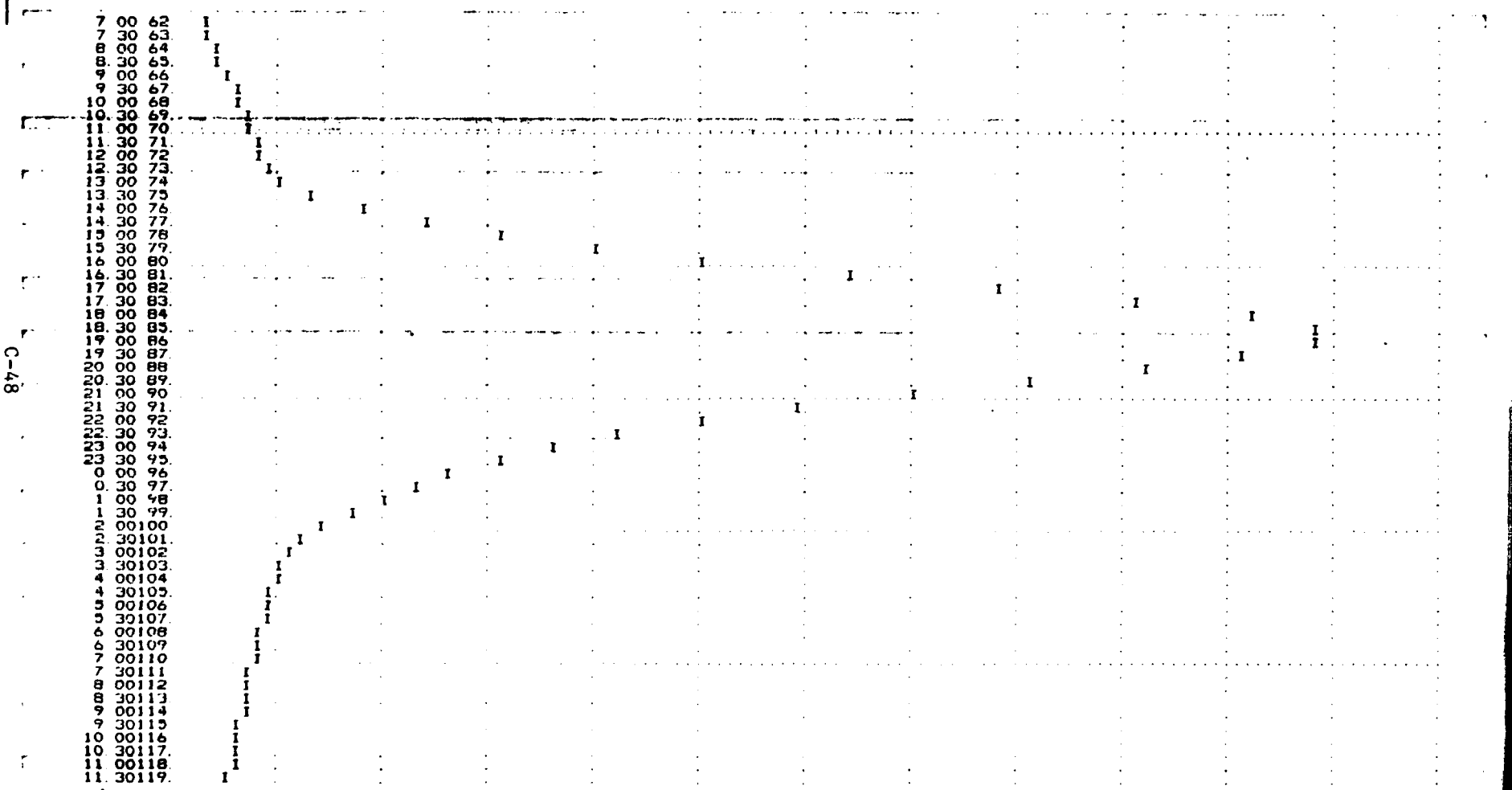
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5 30107
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7 00110
7 30111
8 00112
8 30113
9 00114
9 30115
10 00116
10 30117
11 00118
11 30119

12 00120 I

1*DVN*

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 6

4	4	5	5	6	6	7	7	8	8
8	9	9	9	10	11	12	13	14	15
16	17	17	18	19	21	26	34	45	57
71	93	128	170	213	251	276	282	269	242
213	183	155	131	110	93	79	68	59	54
54	57	65	74	84	93	100	107	112	116
121	132	149	174	205	240	275	307	333	355
373	388	418	493	634	852	1146	1505	1907	2413
3050	3734	4384	4896	5176	5170	4870	4396	3871	3340
2838	2400	2034	1731	1479	1269	1094	943	812	694
589	514	494	474	455	437	420	403	387	372
357	343	329	316	304	291	280	269	258	248

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5176	4011.	1573.	687.	82455
CMS	147.	114.	45.	19.	2335.
INCHES		9.87	15.48	16.91	16.91
MM		250.71	393.21	429.50	429.50
AC-FT		1989	3119.	3407	3407
THOUS CU M		2453.	3848.	4203.	4203.

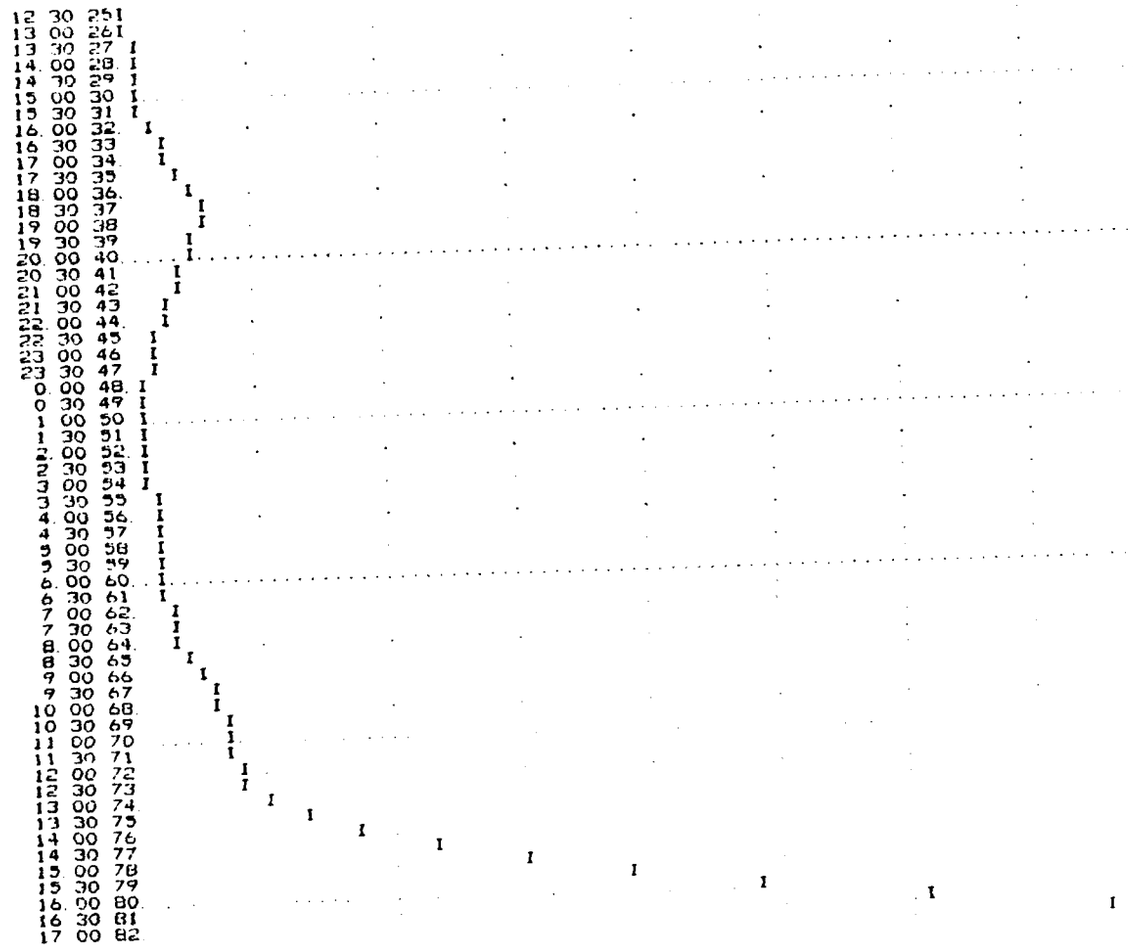
1*DVF*

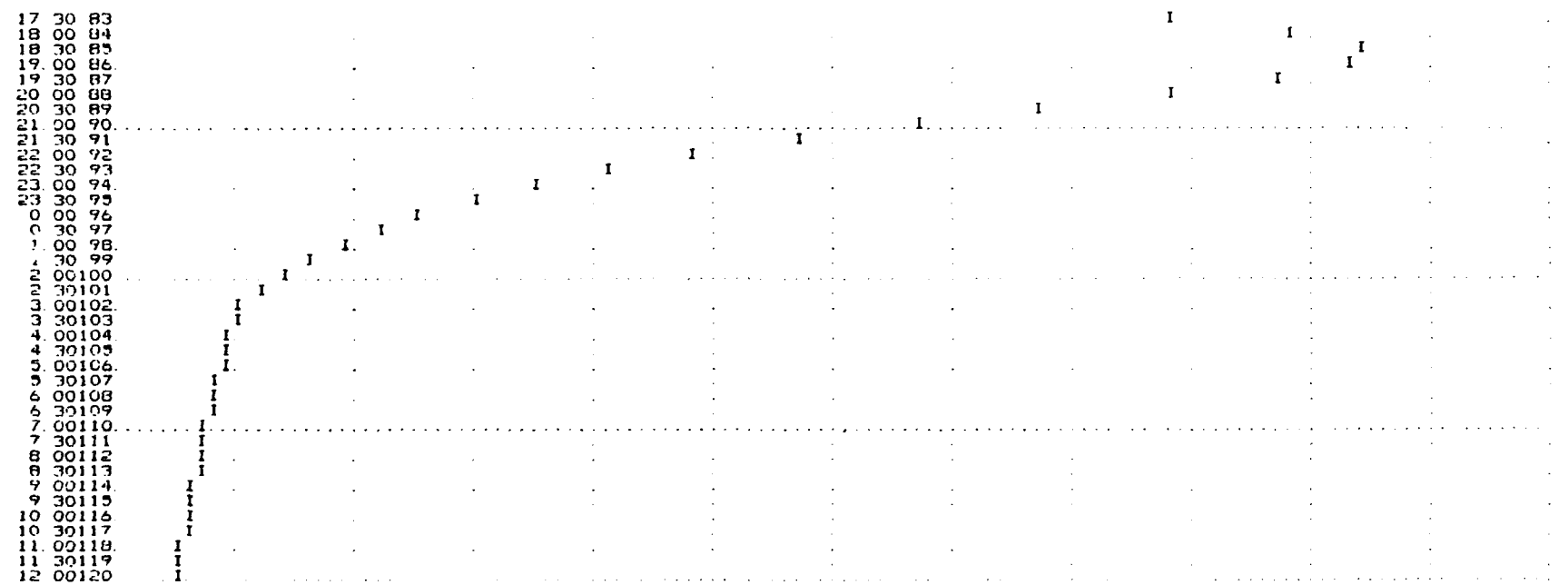
STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	500.	1000	1500.	2000.	2500.	3000.	3500.	4000.	4500.	5000.	5500	0
0 30	11												
1 00	21												
1 30	31												
2 00	41												
2 30	51												
3 00	61												
3 30	71												
4 00	81												
4 30	91												
5 00	101												
5 30	111												
6 00	121												
6 30	131												
7 00	141												
7 30	151												
8 00	161												
8 30	171												
9 00	181												
9 30	191												
10 00	201												
10 30	211												
11 00	221												
11 30	231												
12 00	241												

FLAHERTY GIAVARA ASSOCIATES, P C





1*DVN*

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTID 7

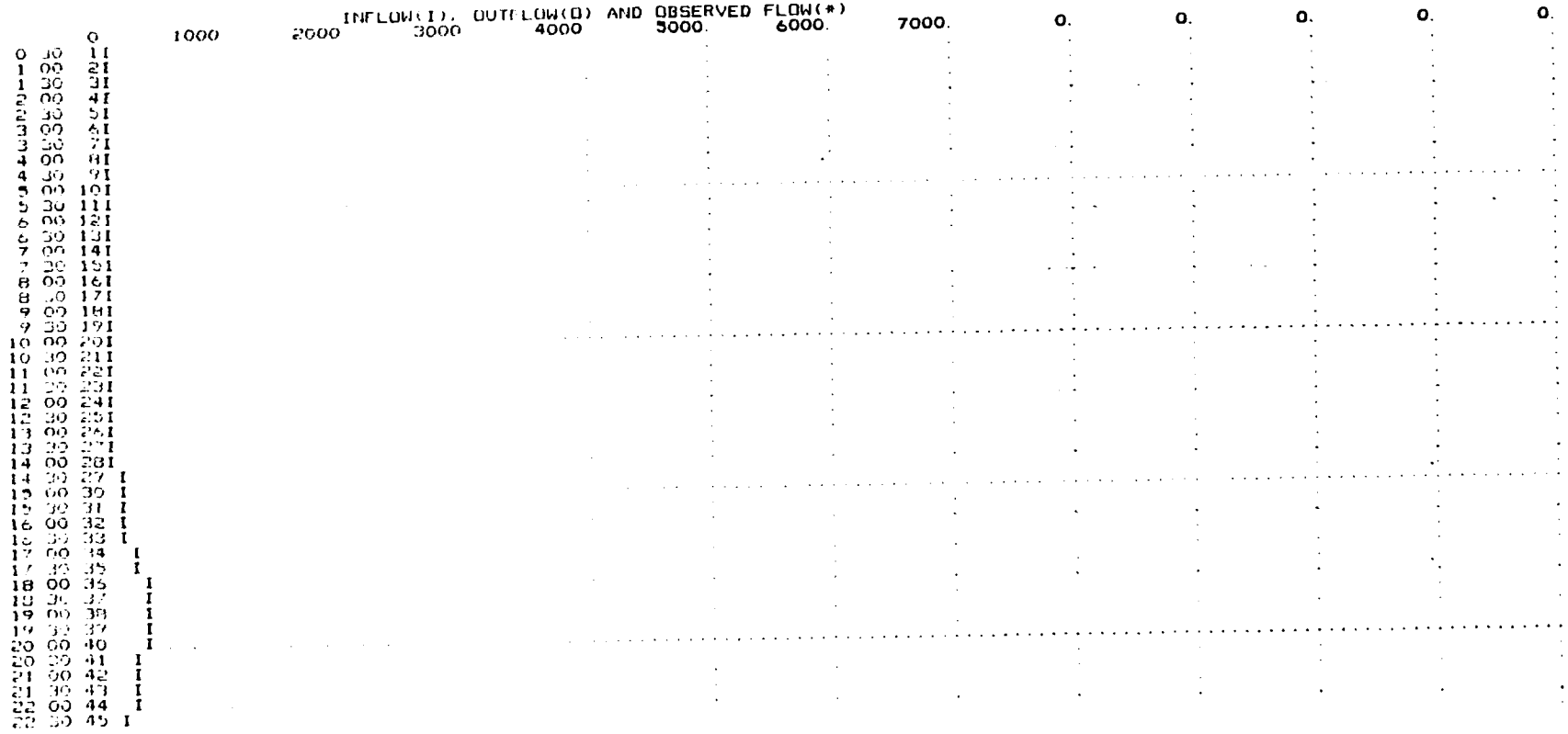
5	5	5	6	7	7	8	9	9	10
10	10	10	11	12	13	14	15	17	18
19	19	20	21	22	25	31	40	52	67
83	109	149	198	249	293	322	330	313	283
248	213	181	152	129	109	93	79	69	63
63	67	75	86	98	108	117	124	130	135
142	154	174	203	239	280	321	358	388	414
435	453	488	575	739	994	1337	1756	2225	2815
3558	4356	5114	5712	6038	6031	5682	5128	4516	3896
3311	2800	2374	2019	1725	1481	1276	1101	947	810
687	600	576	553	531	510	490	470	452	434
416	400	384	369	354	340	327	314	301	289

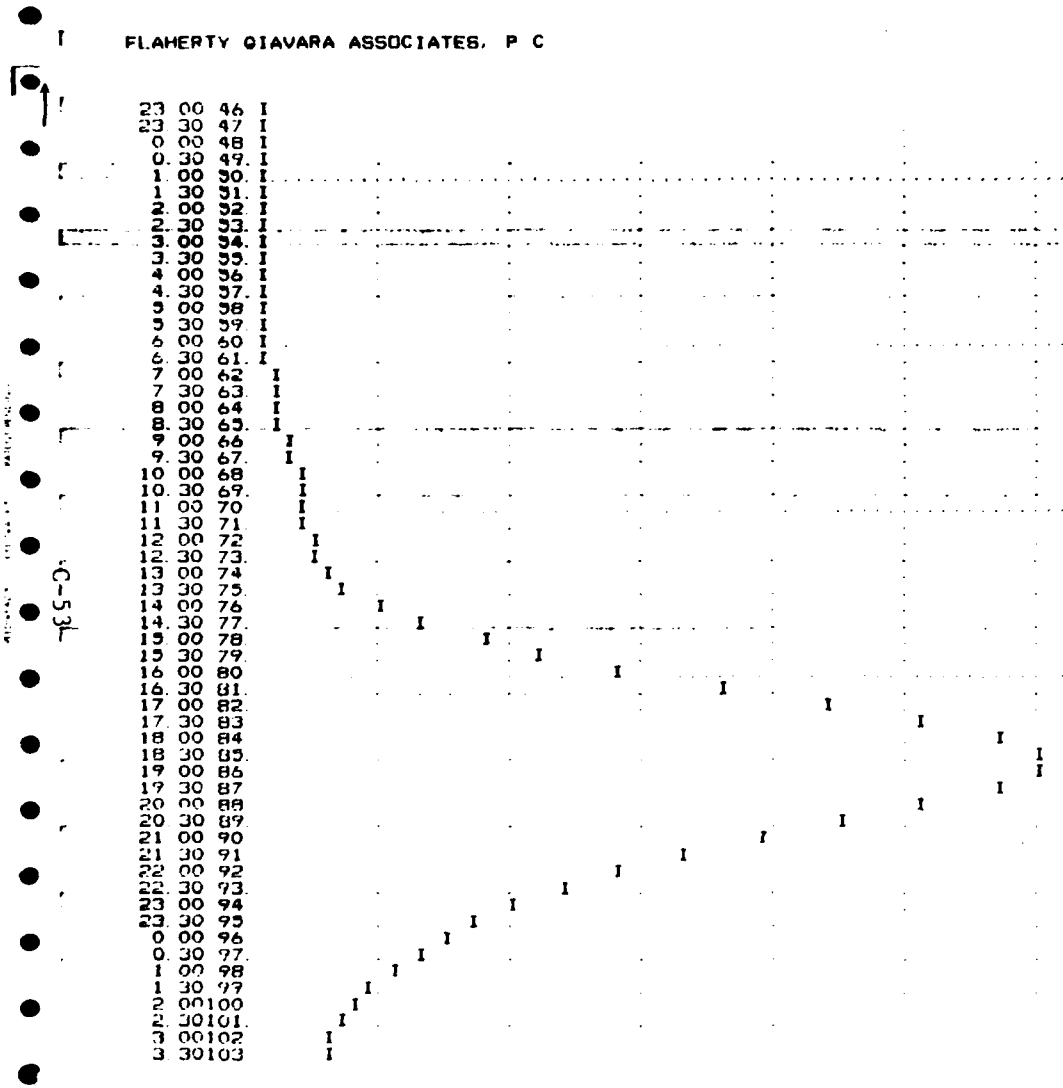
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6038	4679	1835	802	96197
CMS	171	133	52	23	2724
INCHES		11 52	18 06	19 73	19 73
MM		292 49	458 75	501 09	501 09
AC FT		2320	3639	3975	3975
THOUS CU M		2862	4489	4903	4903

I*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

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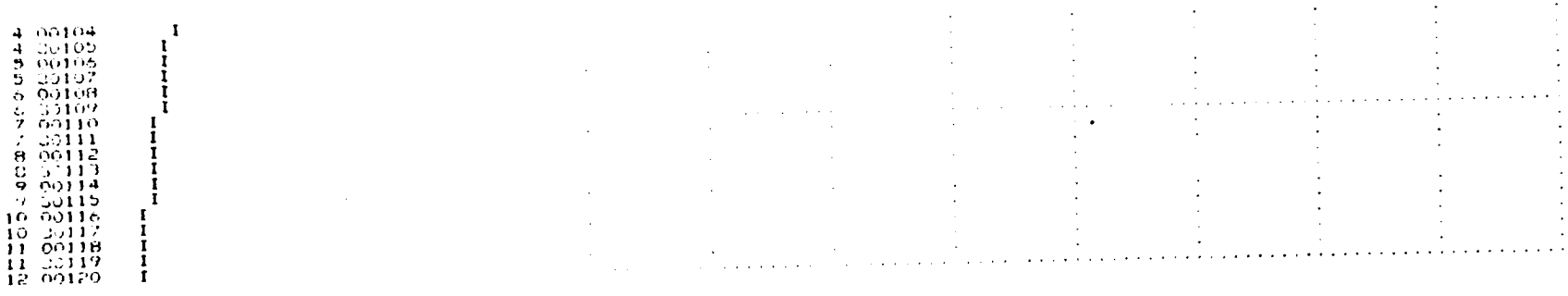
PLANERTY GIAVARA ASSOCIATES, P C



1*DVN*

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 8

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11	12	12	12	13	14	16	17	19	20
21	22	23	24	25	28	35	45	59	76
95	124	170	226	285	335	368	377	358	323
284	244	206	174	147	125	106	91	79	72
71	76	85	99	112	124	134	142	149	154
162	176	199	232	274	320	367	409	444	473
497	517	557	657	845	1135	1528	2006	2543	3217
4067	4978	5845	6528	6901	6893	6494	5861	5161	4453
3785	3200	2713	2308	1972	1692	1458	1258	1082	926
785	686	658	632	607	583	560	537	516	496
476	457	439	421	405	389	373	358	344	330

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6901	5348	2097	916	109940
CMS	195	151	59	26	3113
INCHES		13.16	20.64	22.55	22.55
MM		334.28	524.29	572.67	572.67
AC-FT		2652	4159	4543	4543
THOUS CU M		3271	5130	5604	5604

1*OPT*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

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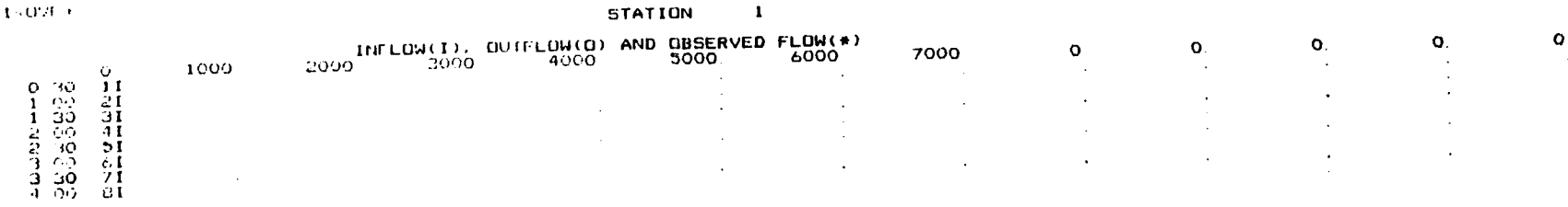

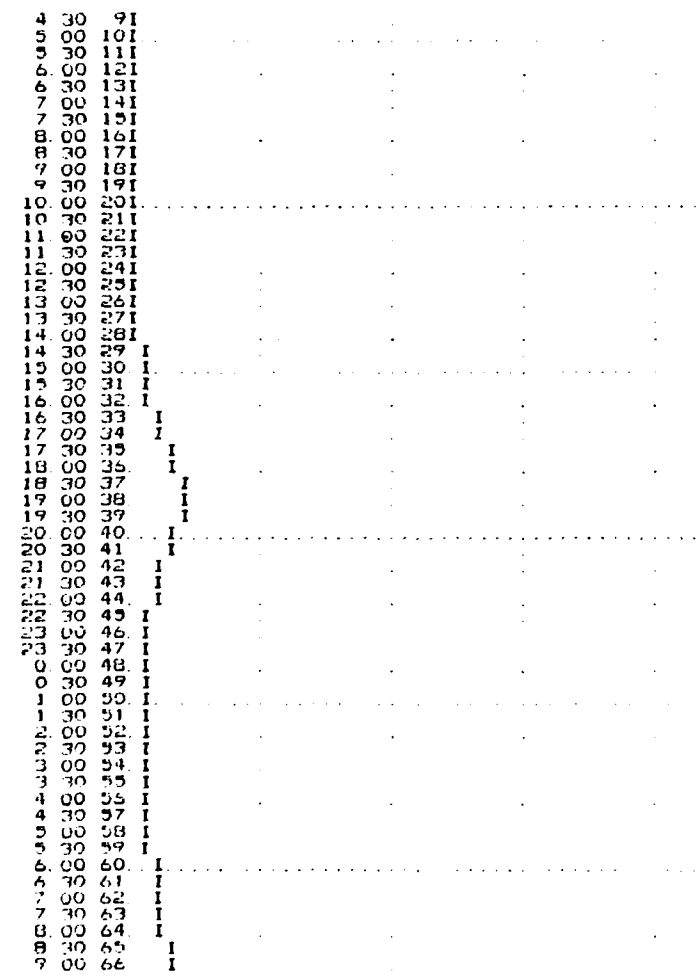
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12 00 24I
12 30 25I
13 00 26I
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14 00 28I
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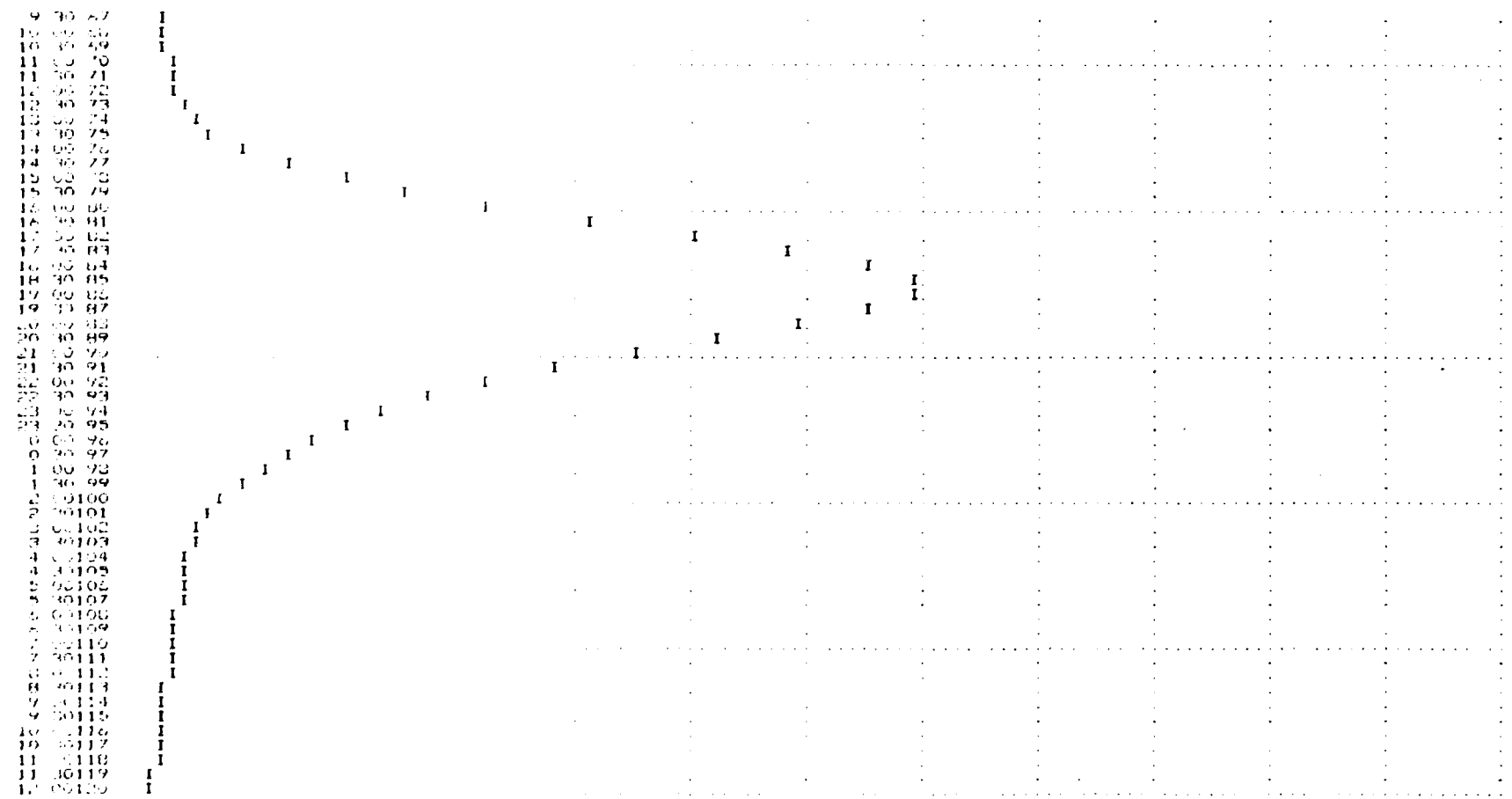


SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 9

7.	7.	8.	8.	9.	10.	11.	12	13.	14.
14	14	15	15	16	18	20.	22	24	25.
27	28	29	29	31	36.	44	57	74	95.
119	155	213	283	356	419	460	471	448	404.
355	305.	258.	218.	184.	156.	132.	113.	99.	90.
89	95	108	123	140.	155	167.	178	186.	193.
202	220.	249.	290	342.	400	459.	511	555	591.
621	647.	697.	822.	1056	1419.	1911	2508	3179.	4021.
5083	6223.	7306.	8160.	8626.	8616.	8117.	7326.	6452.	5566.
4731	4000.	3391.	2885.	2464.	2115	1823.	1572	1353.	1157.
981	857.	823.	790.	759.	729.	700.	672.	645.	620.
595	571.	549.	527.	506.	486.	466.	448	430	413.

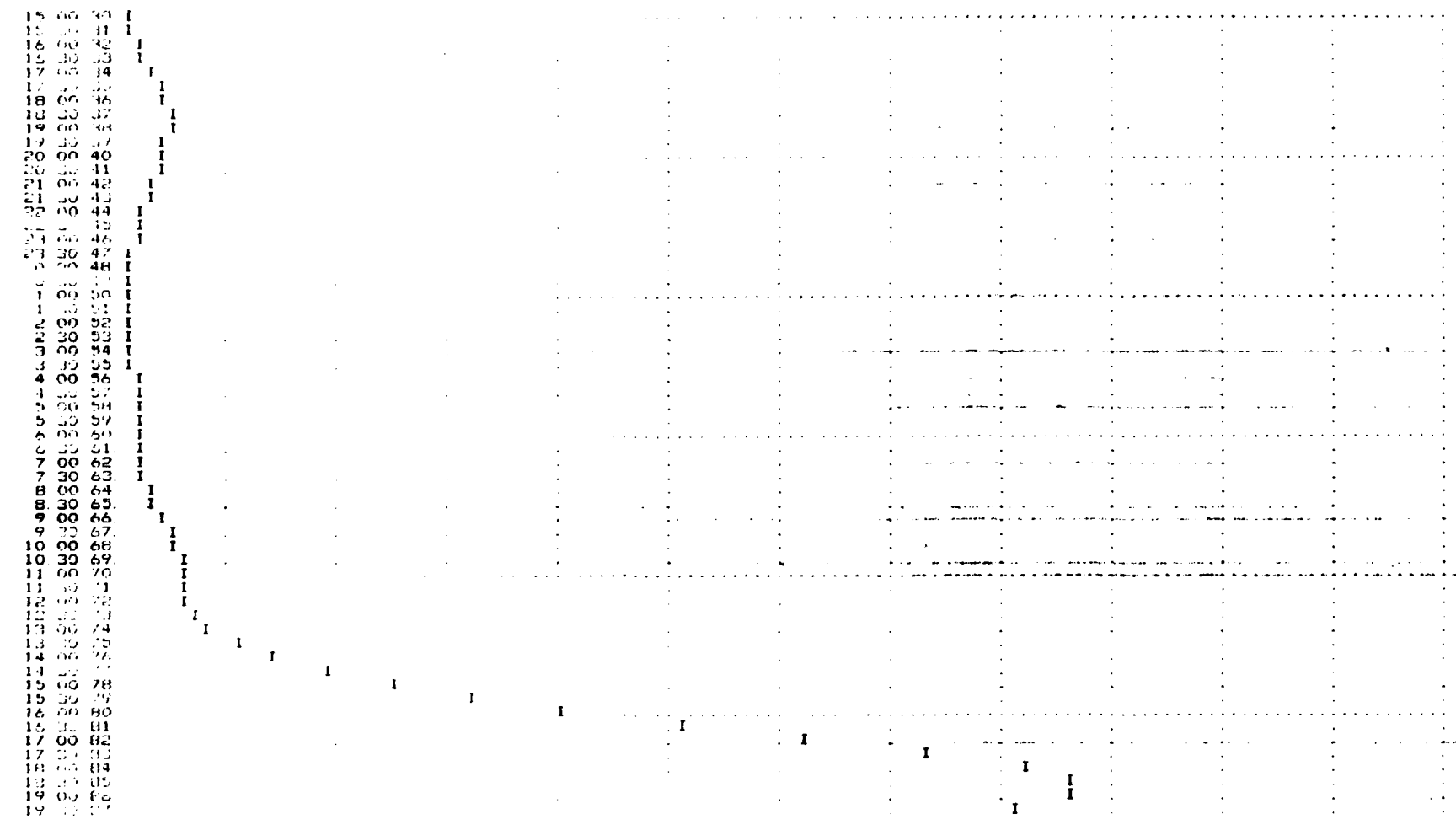
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8626.	6685.	2621.	1145.	137425.
CMS	244	189.	74.	32.	3891.
INCHES		16.45	25.80	28.18	28.18
MM		417.85	655.36	715.84	715.84
AC-FT		3315.	5199.	5679.	5679.
THOUS CU M		4089.	6413.	7005	7005

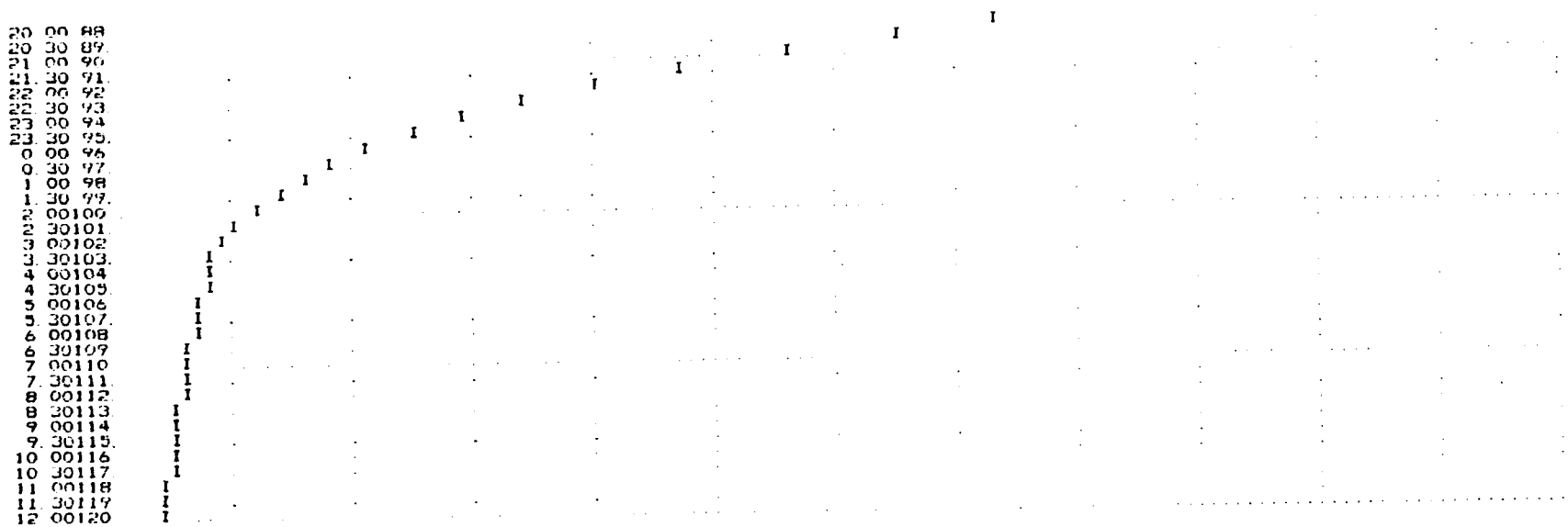
1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	9000.	0.	0.	0.
0 30	1I												
1 00	2I												
1 30	3I												
2 00	4I												
2 30	5I												
3 00	6I												
3 30	7I												
4 00	8I												
4 30	9I												
5 00	10I												
5 30	11I												
6 00	12I												
6 30	13I												
7 00	14I												
7 30	15I												
8 00	16I												
8 30	17I												
9 00	18I												
9 30	19I												
10 00	20I												
10 30	21I												
11 00	22I												
11 30	23I												
12 00	24I												
12 30	25I												
13 00	26I												
13 30	27I												
14 00	28 I												
14 30	29 I												





1*OVN*

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

RESERVOIR ROUTING MODIFIED PULS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0 0	0 000	0 00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
3	0	0	0 000	0 000	0 000	0	-1

STAGE	1244 10	1244 40	1245 40	1245 60	1246 40	1247 40	1248 40	1249 00	1249 40	1250 40
	1251 40	1252 40	1253 40	1254 40						
FLOW	0 00	8 20	74 00	95 30	263 20	486 70	746 00	934 20	1066 50	1434 10

	1636 00	1828 80	2129 40	2484 30
SURFACE AREA=	8	14	21	
CAPACITY=	0	112	287	
ELEVATION=	1244	1254	1264	

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
1244 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1249 0	2.5	1.5	375

STATION 1, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0	0	0	0	0	0	1	1	1	1
1	1	1	1	1	1	1	1	2	2
3	2	2	2	2	2	3	3	3	4
5	6	8	12	18	23	29	34	37	39
39	37	35	32	28	25	22	19	17	15
13	12	11	11	12	13	14	15	16	17
17	18	20	22	25	28	32	37	41	46
50	54	57	62	71	91	138	192	252	323
410	512	627	728	811	850	840	788	716	636
552	472	406	345	294	251	216	186	160	138
117	101	92	87	83	80	76	74	71	69
67	65	62	60	58	55	53	51	49	47

STORAGE

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	2	2	3	4	4	5	6	6	6
6	6	6	5	5	5	4	4	3	3
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	5	5	6	7	7
8	8	9	9	10	12	14	17	19	22
33	30	35	39	41	43	42	41	38	35
31	29	26	23	21	19	18	16	15	14
14	13	12	12	12	11	11	11	11	10
10	10	9	9	9	8	8	8	8	7

STAGE

1244 1	1244 1	1244 1	1244 1	1244 1	1244 1	1244 1	1244 1	1244 1	1244 1
1244 1	1244 1	1244 1	1244 2	1244 2	1244 2	1244 2	1244 2	1244 2	1244 2
1244 2	1244 2	1244 2	1244 3	1244 5	1244 6	1244 7	1244 8	1244 8	1244 9
1244 3	1244 3	1244 4	1244 5	1244 7	1244 7	1244 6	1244 6	1244 5	1244 5
1244 9	1244 8	1244 8	1244 8	1244 5	1244 5	1244 5	1244 5	1244 5	1244 5
1244 5	1244 5	1244 4	1244 4	1244 6	1244 7	1244 8	1244 8	1244 9	1245 0
1244 5	1244 6	1244 6	1244 6	1244 6	1244 7	1244 8	1245 8	1246 1	1246 7
1245 0	1245 1	1245 1	1245 2	1245 4	1245 6	1245 8	1246 1	1246 3	1246 7
1247 1	1247 5	1247 9	1248 3	1248 6	1248 7	1248 7	1248 5	1248 3	1248 0
1247 7	1247 3	1247 0	1246 8	1246 5	1246 3	1246 2	1246 0	1245 9	1245 8

1245.7 1245.6 1245.6 1245.5 1245.5 1245.5 1245.4 1245.4 1245.4 1245.3
1245.3 1245.3 1245.2 1245.2 1245.2 1245.1 1245.1 1245.1 1245.0 1245.0

PEAK OUTFLOW IS 850. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	850.	662.	261.	113.	13563.
CMS	24.	19.	7.	3.	384.
INCHES		1.63	2.57	2.78	2.78
MM		41.36	65.37	70.65	70.65
AC-FT		328.	519.	560.	560.
THOUS CU M		405.	640.	691.	691.

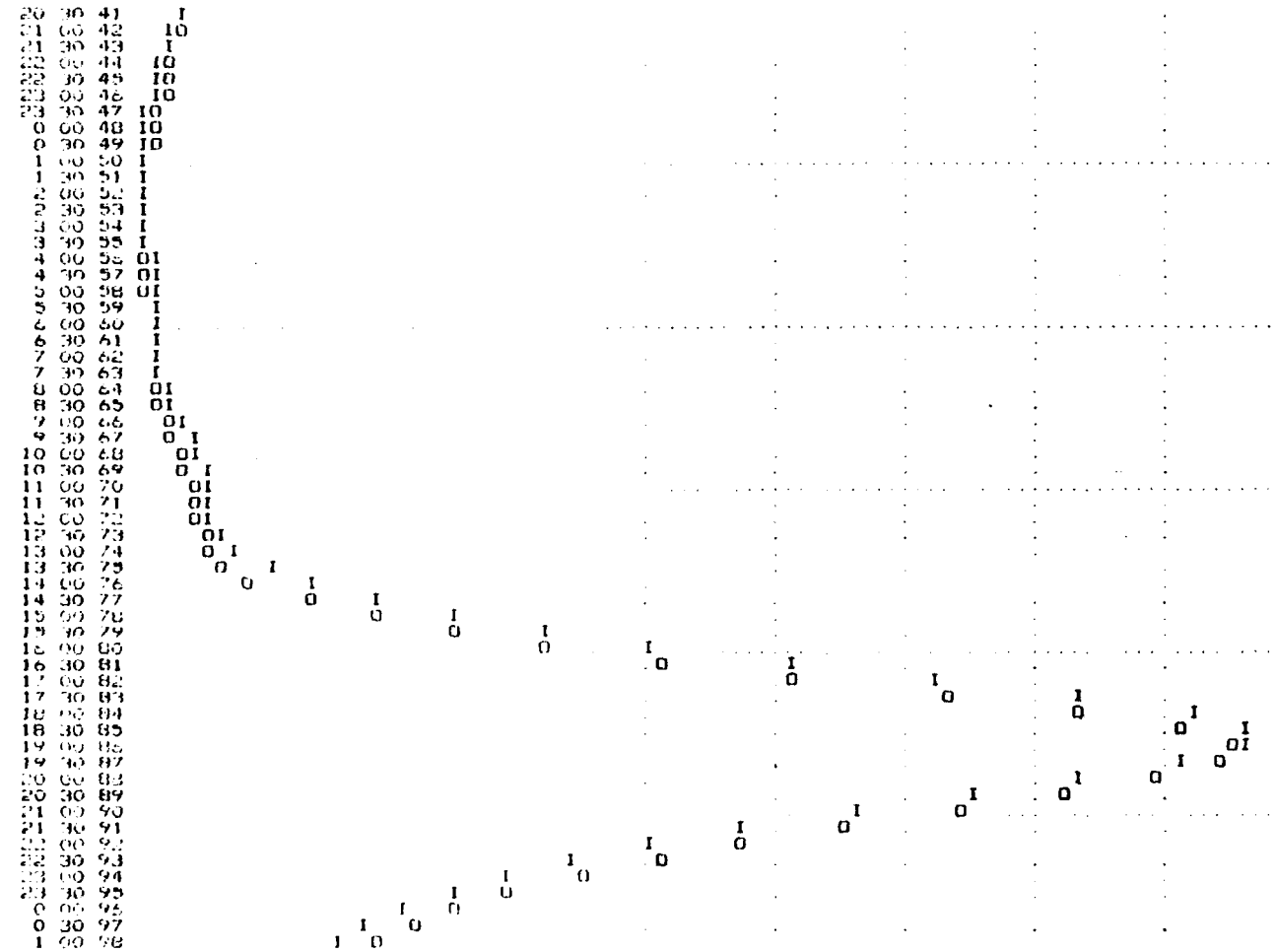
1*OVF *

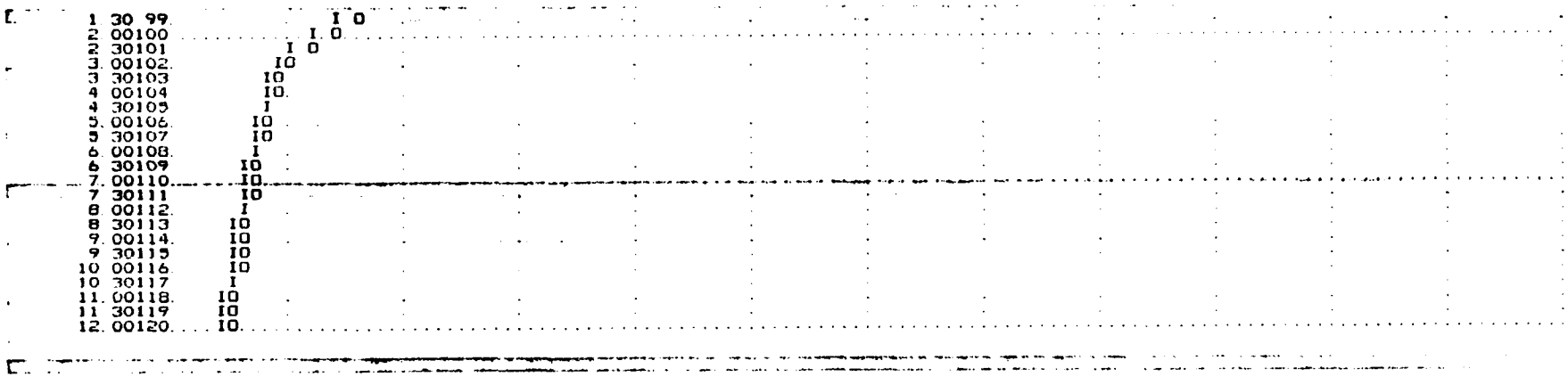
STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0 100 200. 300. 400. 500. 600. 700 800. 900 0 0 0

0 30 1I
1 00 2I
1 30 3I
2 00 4I
2 30 5I
3 00 6I
3 30 7I
4 00 8I
4 30 9I
5 00 10I
5 30 11I
6 00 12I
6 30 13I
7 00 14I
7 30 15I
8 00 16I
8 30 17I
9 00 18I
9 30 19I
10 00 20I
10 30 21I
11 00 22I
11 30 23I
12 00 24I
12 30 25I
13 00 26I
13 30 27I
14 00 28OI
14 30 29OI
15 00 30OI
15 30 31OI
16 00 32 OI
16 30 33 OI
17 00 34. O I
17 30 35 O I
18 00 36 O I
18 30 37 O I
19 00 38. O I
19 30 39 I
20 00 40 I





1*OVN*

STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0	0	1	1	1	1	1	1	1	2
2	2	2	2	2	2	3	3	3	3
4	4	4	4	4	5	5	6	7	8
12	16	22	30	39	50	60	69	76	80
78	73	69	63	57	50	44	39	34	30
26	24	23	23	24	26	27	29	31	33
35	37	40	44	49	56	64	73	86	99
114	122	130	144	173	221	294	391	508	656
841	1136	1437	1596	1718	1727	1647	1497	1326	1155
995	884	773	670	576	493	428	370	319	274
235	202	180	168	159	152	146	140	135	129
124	119	114	110	105	101	97	94	92	89

STORAGE

0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	2	2	2	2
3	3	4	5	6	8	9	10	11	11
11	11	10	9	9	8	7	6	6	5
5	4	4	4	4	5	5	5	5	6
6	6	6	7	8	8	10	11	12	13
13	14	14	15	16	18	21	25	30	36
42	48	51	52	53	53	53	52	50	49
47	44	40	36	33	30	27	24	22	20
19	17	16	16	15	15	15	14	14	14
14	14	13	13	13	13	13	12	12	12

STAGE

1244.1	1244.1	1244.1	1244.1	1244.1	1244.1	1244.1	1244.1	1244.2	1244.2
1244.2	1244.2	1244.2	1244.2	1244.2	1244.2	1244.2	1244.2	1244.2	1244.2
1244.2	1244.2	1244.2	1244.3	1244.3	1244.3	1244.3	1244.3	1244.3	1244.4
1244.5	1244.5	1244.6	1244.7	1244.9	1245.0	1245.2	1245.3	1245.4	1245.5
1245.4	1245.4	1245.3	1245.2	1245.1	1245.0	1245.0	1244.9	1244.8	1244.7
1244.7	1244.6	1244.6	1244.6	1244.6	1244.7	1244.7	1244.7	1244.8	1244.8
1244.8	1244.8	1244.9	1244.9	1245.0	1245.1	1245.3	1245.4	1245.5	1245.6
1245.7	1245.7	1245.8	1245.8	1246.0	1246.2	1246.5	1247.0	1247.5	1248.1
1248.7	1249.3	1249.5	1249.6	1249.7	1249.7	1249.6	1249.5	1249.4	1249.3
1249.1	1248.8	1248.5	1248.1	1247.7	1247.4	1247.1	1246.9	1246.7	1246.4
1246.3	1246.1	1246.0	1245.9	1245.9	1245.9	1245.8	1245.8	1245.8	1245.8
1245.7	1245.7	1245.7	1245.7	1245.6	1245.6	1245.6	1245.6	1245.6	1245.5

PEAK OUTFLOW IS 1727 AT TIME 43.00 HOURS

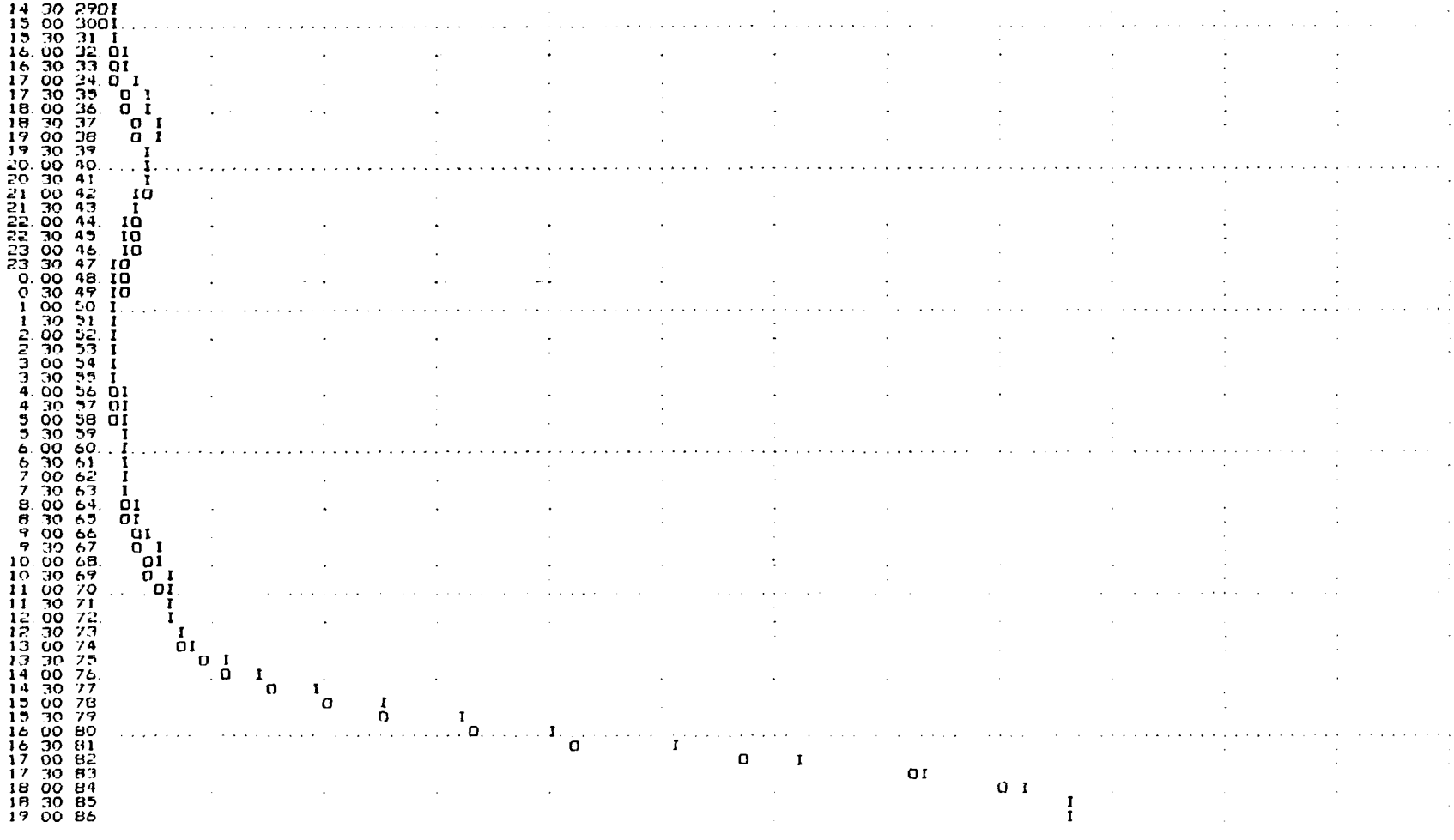
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1727	1327	524.	227	27189
CMS	49	38.	15.	6.	770.
INCHES		3.27	5.15	5.58	5.58
MM		82.95	130.91	141.63	141.63
AC-FT		658	1038.	1124	1124
THOUS CU M		812	1281.	1386.	1386.

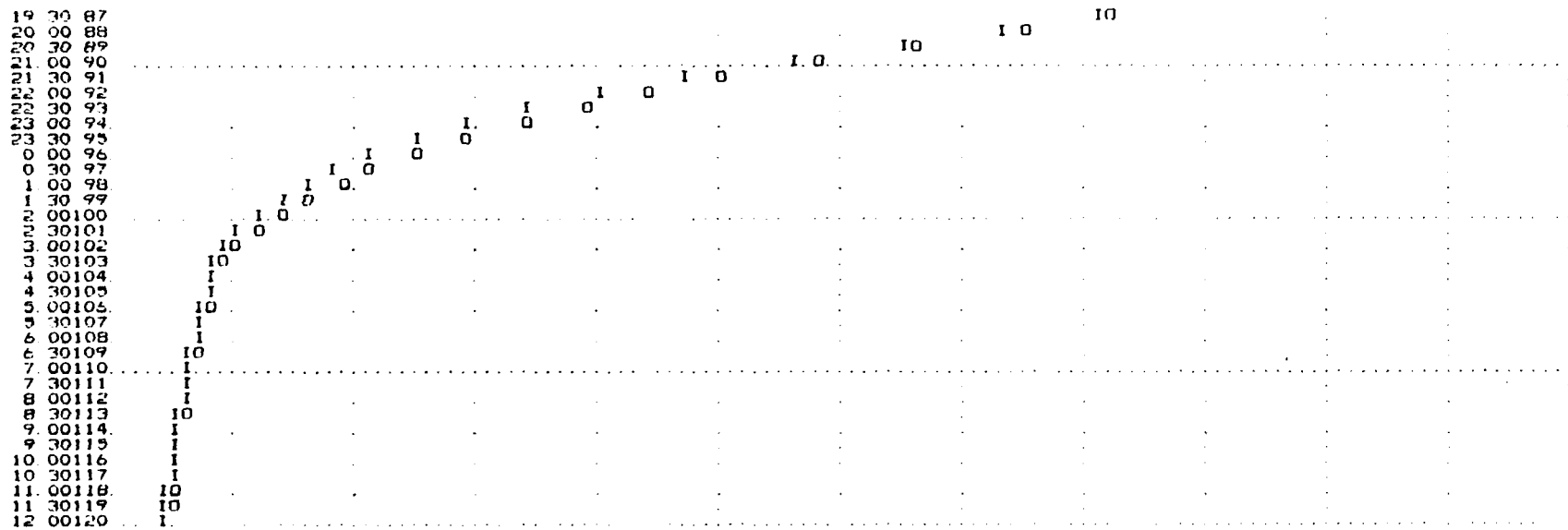
140VE1

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	200	400	600	800	1000.	1200	1400.	1600.	1800.	0.	0.	0.
0 30	1I												
1 00	2I												
1 30	3I												
2 00	4I												
2 30	5I												
3 00	6I												
3 30	7I												
4 00	8I												
4 30	9I												
5 00	10I												
5 30	11I												
6 00	12I												
6 30	13I												
7 00	14I												
7 30	15I												
8 00	16I												
8 30	17I												
9 00	18I												
9 30	19I												
10 00	20I												
10 30	21I												
11 00	22I												
11 30	23I												
12 00	24I												
12 30	25I												
13 00	26I												
13 30	27I												
14 00	28OI												


14 30 29
15 00 30
15 30 31
16 00 32
16 30 33
17 00 34
17 30 35
18 00 36
18 30 37
19 00 38
19 30 39
20 00 40
20 30 41
21 00 42
21 30 43
22 00 44
22 30 45
23 00 46
23 30 47
0 00 48
0 30 49
1 00 50
1 30 51
2 00 52
2 30 53
3 00 54
3 30 55
4 00 56
4 30 57
5 00 58
5 30 59
6 00 60
6 30 61
7 00 62
7 30 63
8 00 64
8 30 65
9 00 66
9 30 67
10 00 68
10 30 69
11 00 70
11 30 71
12 00 72
12 30 73
13 00 74
13 30 75
14 00 76
14 30 77
15 00 78
15 30 79
16 00 80
16 30 81
17 00 82
17 30 83
18 00 84
18 30 85
19 00 86



1*OVN*

STATION 1, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0	1	1	1	1	2	2	2	2	
3	3	3	3	3	4	4	4	5	5
5	6	6	6	7	7	8	9	12	16
21	26	34	45	59	75	100	126	134	130
119	106	93	84	75	68	61	55	48	43
38	35	34	34	36	38	41	44	47	50
52	55	59	65	73	88	111	134	151	165
176	185	196	216	258	333	442	593	775	1044
1486	1795	2149	2411	2576	2592	2466	2236	1979	1715
1465	1245	1063	926	832	724	632	546	472	410
352	302	269	251	239	229	219	211	202	194
186	179	172	165	158	152	146	140	135	129

STORAGE

0	0	0	0	0	0	0	1	1	1
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	3	3	3
4.	5.	6.	7.	9.	11.	13.	14.	14.	14
14	13	12	12	11	10	9	8	7	7
6	6	6	6	6.	6	7	7	7	8
8	8	9	10	11	12	13	14	15	16
16.	16.	17.	18.	20.	23.	27.	33	40.	47
51	54	56	58	59	59	58	57	55	53.
51	49	48	45	42.	38	35	32.	29	26
23	21	20	19	19	18.	18	17	17	17
16.	16.	16.	16.	15.	15.	15.	14	14	14

STAGE

1244.1	1244.1	1244.1	1244.1	1244.1	1244.2	1244.2	1244.2	1244.2	1244.2
1244.2	1244.2	1244.2	1244.2	1244.2	1244.2	1244.2	1244.3	1244.3	1244.3
1244.3	1244.3	1244.3	1244.3	1244.3	1244.4	1244.4	1244.4	1244.5	1244.5
1244.6	1244.7	1244.8	1245.0	1245.2	1245.4	1245.6	1245.7	1245.8	1245.8
1245.7	1245.6	1245.6	1245.5	1245.4	1245.3	1245.2	1245.1	1245.0	1244.9
1244.9	1244.8	1244.8	1244.8	1244.8	1244.9	1244.9	1244.9	1245.0	1245.0
1245.1	1245.1	1245.2	1245.3	1245.4	1245.5	1245.7	1245.8	1245.9	1245.9
1246.0	1246.0	1246.1	1246.2	1246.4	1246.7	1247.2	1247.8	1248.5	1249.2
1249.5	1249.7	1250.0	1250.1	1250.2	1250.2	1250.1	1250.0	1249.9	1249.7
1249.5	1249.4	1249.2	1249.0	1248.7	1248.3	1248.0	1247.6	1247.3	1247.1
1246.8	1246.6	1246.4	1246.3	1246.3	1246.2	1246.2	1246.1	1246.1	1246.1
1246.0	1246.0	1246.0	1245.9	1245.9	1245.9	1245.8	1245.8	1245.8	1245.8

PEAK OUTFLOW IS 2592. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2592	2001.	786.	341.	40885
CMS	73.	57.	22.	10.	1158.
INCHES		4.92	7.74	8.38	8.38
MM		125.09	196.53	212.97	212.97
AC-FT		992	1559	1689	1689
THOUS CU M		1224.	1923.	2084.	2084.

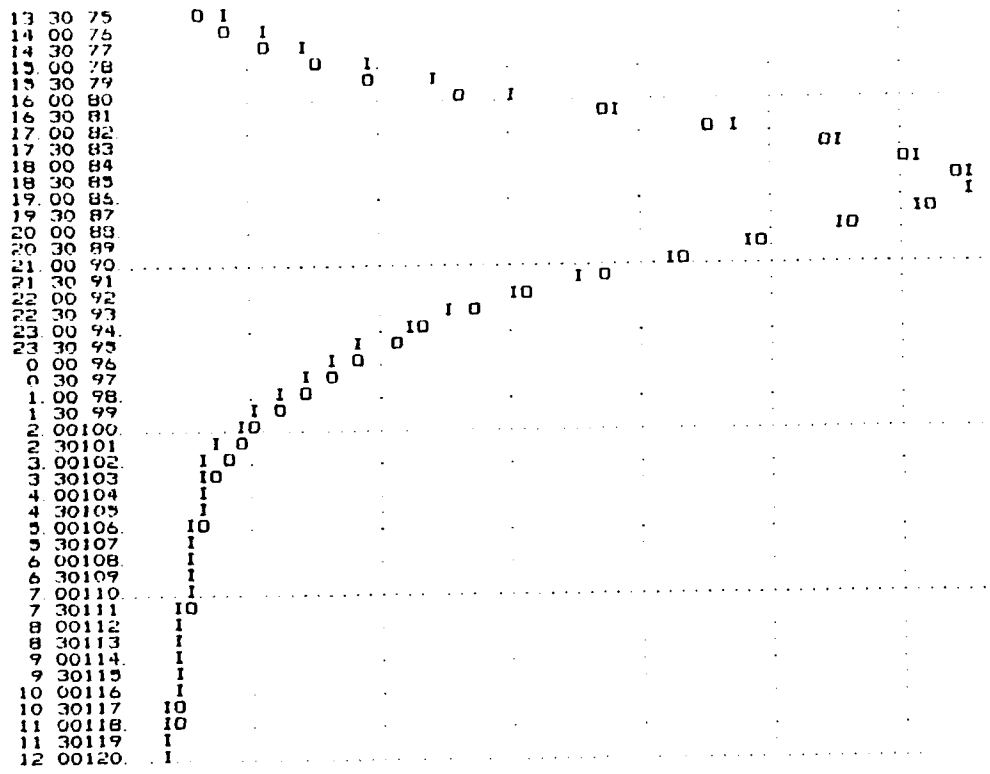
1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	400	800.	1200	1600	2000	2400	2800	0	0	0.	0	0
0 30	1I												
1 00	2I												
1 30	3I												
2 00	4I												
2 30	5I												
3 00	6I												
3 30	7I												
4 00	8I												
4 30	9I												
5 00	10I												
5 30	11I												
6 00	12I												
6 30	13I												
7 00	14I												
7 30	15I												
8 00	16I												

```
 8 30 17I
 9 00 18I
 9 30 19I
10 00 20I
10 30 21I
11 00 22I
11 30 23I
12 00 24I
12 30 25I
13 00 26I
13 30 27I
14 00 28I
14 30 29OI
15 00 30OI
15 30 31 I
16 00 32 I
16 30 33 OI
17 00 34 OI
17 30 35 O I
18 00 36  OI
18 30 37  OI
19 00 38   OI
19 30 39   I
20 00 40   I
20 30 41   I
21 00 42  IO
21 30 43  I
22 00 44  I
22 30 45 IO
23 00 46 IO
23 30 47 IO
 0 00 48 I
 0 30 49 I
 1 00 50 I
 1 30 51 I
 2 00 52 I
 2 30 53 I
 3 00 54 I
 3 30 55 I
 4 00 56 I
 4 30 57 I
 5 00 58 I
 5 30 59 I
 6 00 60 I
 6 30 61 OI
 7 00 62 OI
 7 30 63 OI
 8 00 64  I
 8 30 65  OI
 9 00 66  OI
 9 30 67   I
10 00 68  OI
10 30 69   I
11 00 70   I
11 30 71   OI
12 00 72    I
12 30 73    I
13 00 74    OI
```



1*OVN*

STATION 1, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0	1	1	1	2	2	2	3	3
3	4	4	4	5	5	5	6	7

7	8	8	9	10	11	12.	14.	18.	22.
28	36	46	61	81.	121.	157.	176.	181.	174
159	141	122	104	91.	82	73.	66.	60.	54.
49	45	44	45.	47.	50.	54.	58.	62.	66.
69	74	81	92	113.	136.	159.	182.	202.	220.
234	247	261	289	346.	443	596.	800	1128.	1566
1945	2428	2860	3222.	3432.	3457.	3285.	2981.	2629.	2281.
1944	1649.	1400	1197.	1030.	912.	817.	715.	625.	539.
463	401	358	335.	318.	305.	292.	280.	269.	258.
248	209	229	220	211.	203	195.	187.	180.	172.

STORAGE

0	0	0	0.	0.	1.	1.	1.	1.	1.
1	1	1	1	1.	1.	2.	2	2.	2.
2	2	2	2	3	3.	3.	3.	4.	4.
5	6	7	9.	11.	14.	15	16.	16.	16.
15	15	14	13.	12.	11.	11.	10.	9.	8.
8	7	7	7.	7.	8	8.	9.	9	10.
10	11	11	12	13.	14.	15.	16	17	18.
19	19	20	21.	23.	27.	33.	41.	48.	52.
55	58	60	63	64	64.	63.	61.	59.	57.
55	53	51	49	47.	45	42.	38	35	31.
28	26	24	23	22.	21.	21.	20.	20	20.
19.	19.	18.	18	18.	17.	17.	16.	16.	16.

STAGE

1244 1	1244 1	1244 1	1244 1	1244.2	1244.2	1244.2	1244.2	1244.2	1244.2
1244 2	1244 2	1244 2	1244 3	1244.3	1244.3	1244.3	1244.3	1244.3	1244.3
1244 4	1244 4	1244 4	1244 4	1244.4	1244.4	1244.5	1244.5	1244.5	1244.6
1244 7	1244 8	1245 0	1245 2	1245.5	1245.7	1245.9	1246.0	1246.0	1246.0
1245 9	1245 8	1245 7	1245 6	1245.6	1245.5	1245.4	1245.3	1245.2	1245.1
1245 0	1245 0	1244 9	1245.0	1245.0	1245.0	1245.1	1245.2	1245.2	1245.3
1245 3	1245 4	1245.5	1245 6	1245.7	1245.8	1245.9	1246.0	1246.1	1246.2
1246 3	1246 3	1246 4	1246.5	1246.8	1247.2	1247.8	1248.6	1249.2	1249.6
1249 8	1250 1	1250 3	1250 5	1250.6	1250.6	1250.6	1250.4	1250.2	1250.0
1249 8	1249 6	1249 5	1249 3	1249.1	1248.9	1248.6	1248.3	1247.9	1247.6
1247 3	1247 0	1246 8	1246.7	1246.6	1246.6	1246.5	1246.5	1246.4	1246.4
1246 3	1246 3	1246 2	1246 2	1246.2	1246.1	1246 1	1246.0	1246 0	1246.0

PEAK OUTFLOW IS 3457 AT TIME 43 00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3457	2673.	1048.	455	54583.
CMS	98	76	30.	13.	1546.
INCHES		6.58	10.32	11.19	11.19
MM		167.05	262.05	284.32	284.32
AC-FT		1325	2079.	2256.	2256.
THOUS CU M		1635	2564.	2782.	2782

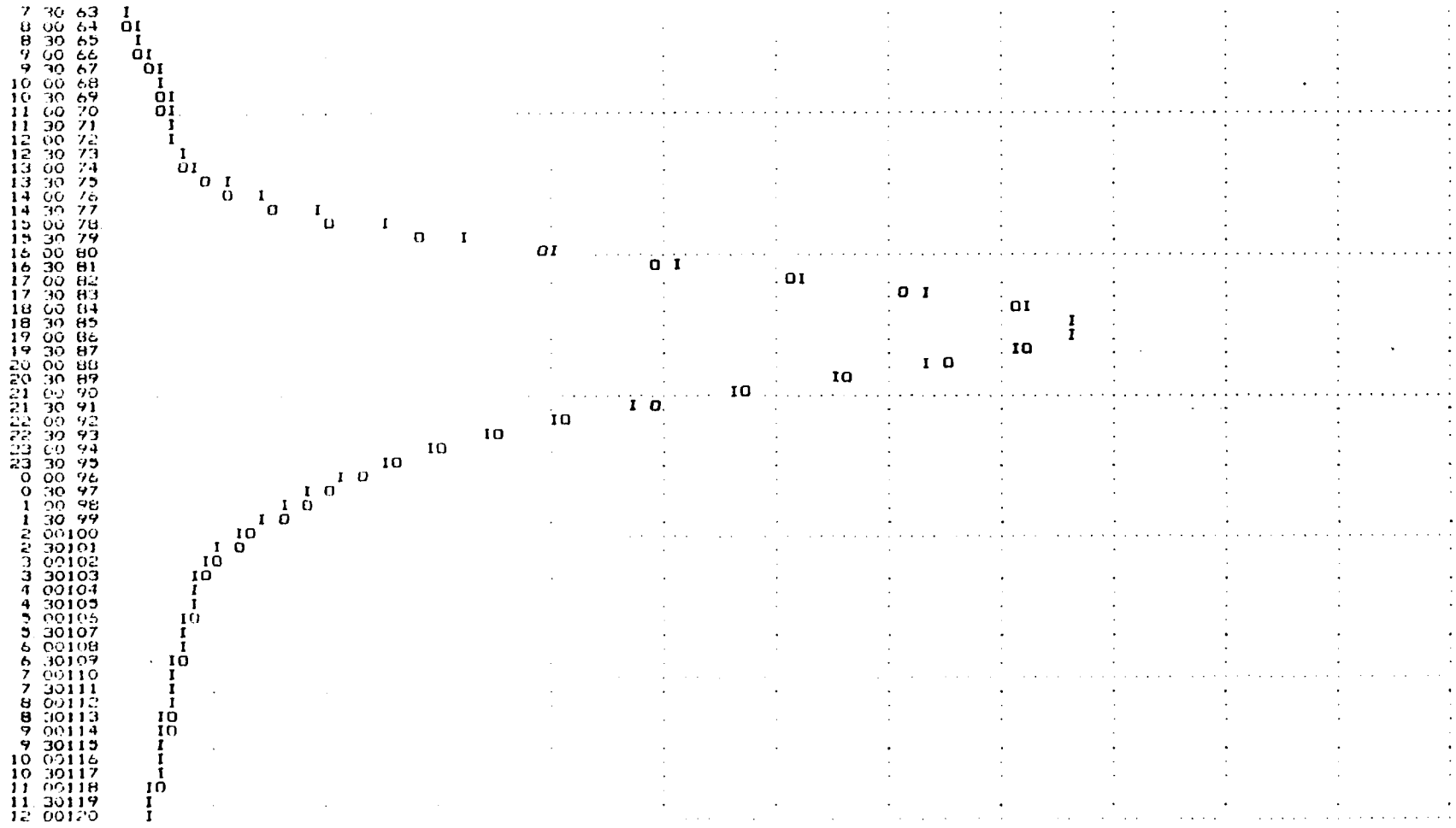
1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	400	800	1200	1600	2000.	2400	2800	3200	3600.	0.	0.	0
0 30	1I												
1 00	2I												
1 30	3I												
2 00	4I												

```
 2 30  5I
 3 00  6I
 3 30  7I
 4 00  8I
 4 30  9I
 5 00 10I
 5 30 11I
 6 00 12I
 6 30 13I
 7 00 14I
 7 30 15I
 8 00 16I
 8 30 17I
 9 00 18I
 9 30 19I
10 00 20I
10 30 21I
11 00 22I
11 30 23I
12 00 24I
12 30 25I
13 00 26I
13 30 27I
14 00 28OI
14 30 29OI
15 00 30 I
15 30 31 I
16 00 32 OI
16 30 33 OI
17 00 34  OI
17 30 35  O I
18 00 36   OI
18 30 37    OI
19 00 38    OI
19 30 39    IO
20 00 40    I
20 30 41    I
21 00 42   IO
21 30 43   I
22 00 44  IO
22 30 45  I
23 00 46  I
23 30 47 IO
 0 00 48 IO
 0 30 49 I
 1 00 50 I
 1 30 51 I
 2 00 52 I
 2 30 53 I
 3 00 54 I
 3 30 55 I
 4 00 56 OI
 4 30 57 OI
 5 00 58 OI
 5 30 59  I
 6 00 60  I
 6 30 61  I
 7 00 62  I
```


7 30 63
8 00 64
8 30 65
9 00 66
9 30 67
10 00 68
10 30 69
11 00 70
11 30 71
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14 00 76
14 30 77
15 00 78
15 30 79
16 00 80
16 30 81
17 00 82
17 30 83
18 00 84
18 30 85
19 00 86
19 30 87
20 00 88
20 30 89
21 00 90
21 30 91
22 00 92
22 30 93
23 00 94
23 30 95
0 00 96
0 30 97
1 00 98
1 30 99
2 00100
2 30101
3 00102
3 30103
4 00104
4 30105
5 00105
5 30107
6 00108
6 30109
7 00110
7 30111
8 00112
8 30113
9 00114
9 30115
10 00116
10 30117
11 00118
11 30119
12 00120

1*OVN*

STATION 1, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0	1.	1.	2.	2.	2.	3	3	4	4
4.	5.	5.	5.	6.	6.	6.	7.	8.	8.
9	11	12.	12.	13.	14	16.	18	22.	28.
35.	44.	58.	76.	119.	168.	202.	222.	227	218.
200.	177.	153.	131.	111.	94	85.	76	69	63
58.	55.	54.	55.	58.	62.	67.	72	79.	85
91	98.	110	126.	147.	172.	200.	227	252.	275.
294	309.	327.	362.	432.	558.	748.	1066	1561	1915.
2465	3027.	3579.	4031.	4293.	4320.	4103.	3721	3289	2847
2423.	2055.	1744.	1487.	1274.	1100.	958.	869.	764	668.
573	494.	446.	418	398.	381.	365	351.	337	323.
310.	298.	286.	274	264.	254.	244.	234	225	216.

STORAGE

0	0	0	0	1.	1.	1.	1	1.	1.
1.	1.	1	2.	2.	2.	2	2	2	2
3	3	3.	3.	3.	3.	3	4	4	5
6.	7.	9.	11.	14.	16.	17.	18	18	18.
17.	16.	15.	14	13.	13.	12.	11	10.	9.
9.	8.	8.	8.	9.	9.	10	11	11	12.
12.	13.	13.	14.	15.	16.	17.	18	19	20.
21.	22.	22.	24.	27.	32.	39.	48	52	55
58	61	65	67	69	69.	68.	66	63.	60.
58.	56.	53	51	50	48.	46	43	40	36
33.	30	27	26	25	25.	24	23	23	22
22.	21.	21.	20.	20.	19.	19.	19	18	18

STAGE

1244.1	1244.1	1244.1	1244.2	1244.2	1244.2	1244.2	1244.2	1244.2	1244.2
1244.3	1244.3	1244.3	1244.3	1244.3	1244.3	1244.3	1244.4	1244.4	1244.4
1244.4	1244.4	1244.5	1244.5	1244.5	1244.5	1244.5	1244.6	1244.6	1244.7
1244.8	1245.0	1245.1	1245.4	1245.7	1245.9	1246.1	1246.2	1246.2	1246.2
1246.1	1246.0	1245.9	1245.8	1245.7	1245.6	1245.5	1245.4	1245.3	1245.2
1245.2	1245.1	1245.1	1245.1	1245.2	1245.2	1245.3	1245.4	1245.4	1245.5
1245.6	1245.6	1245.7	1245.7	1245.8	1246.0	1246.1	1246.2	1246.3	1246.5
1246.5	1246.6	1246.7	1246.8	1247.2	1247.7	1248.4	1249.2	1249.6	1249.8
1250.1	1250.4	1250.7	1250.9	1251.0	1251.1	1251.0	1250.8	1250.6	1250.3
1250.1	1249.9	1249.7	1249.5	1249.4	1249.2	1249.0	1248.8	1248.5	1248.1
1247.7	1247.4	1247.2	1247.1	1247.0	1246.9	1246.9	1246.8	1246.7	1246.7
1246.6	1246.6	1246.5	1246.5	1246.4	1246.4	1246.3	1246.3	1246.2	1246.2

PEAK OUTFLOW IS 4320. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4320	3340	1310	569	68281
CMS	122.	95.	37.	16.	1933.
INCHES		8.22	12.90	14.00	14.00
MM		208.79	327.56	355.67	355.67

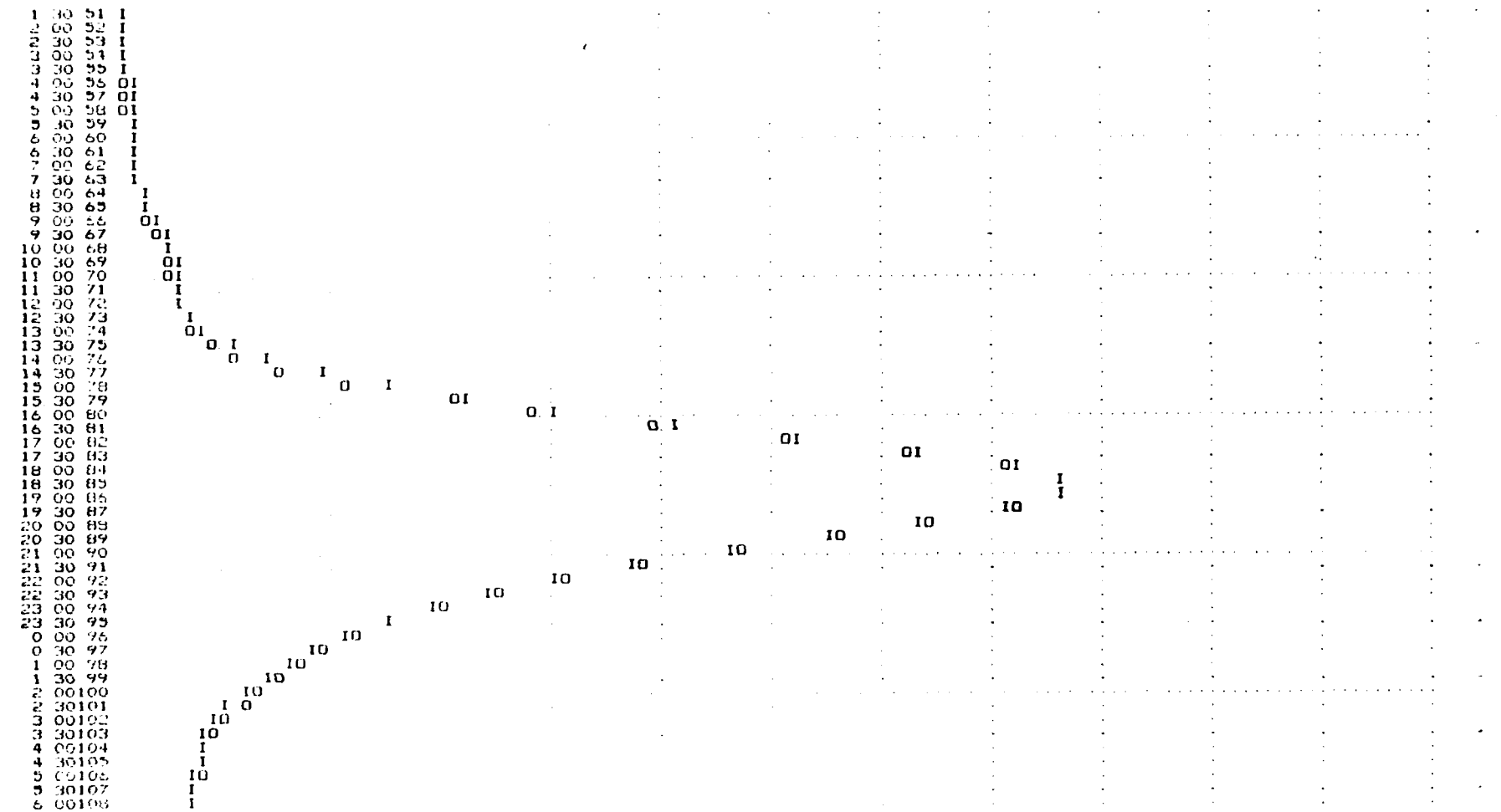
AC-FT	1656.	2599.	2822.	2822.
THOUS CU M	2043	3205.	3480.	3480.

1*OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	500	1000	1500.	2000.	2500.	3000.	3500.	4000.	4500.	0.	0.	0.
0 30	11												
1 00	21												
1 30	31												
2 00	41												
2 30	51												
3 00	61												
3 30	71												
4 00	81												
4 30	91												
5 00	101												
5 30	111												
6 00	121												
6 30	131												
7 00	141												
7 30	151												
8 00	161												
8 30	171												
9 00	181												
9 30	191												
10 00	201												
10 30	211												
11 00	221												
11 30	231												
12 00	241												
12 30	251												
13 00	261												
13 30	271												
14 00	2801												
14 30	2901												
15 00	30 I												
15 30	31 I												
16 00	32 OI												
16 30	33 OI												
17 00	34 OI												
17 30	35 O I												
18 00	36 OI												
18 30	37 OI												
19 00	38 OI												
19 30	39 IO												
20 00	40 I												
20 30	41 I												
21 00	42 IO												
21 30	43 I												
22 00	44 IO												
22 30	45 I												
23 00	46 I												
23 30	47 IO												
0 00	48 IO												
0 30	49 I												
1 00	50 I												


1 30 51 I
2 00 52 I
2 30 53 I
3 00 54 I
3 30 55 I
4 00 56 OI
4 30 57 OI
5 00 58 OI
5 30 59 I
6 00 60 I
6 30 61 I
7 00 62 I
7 30 63 I
8 00 64 I
8 30 65 I
9 00 66 OI
9 30 67 OI
10 00 68 I
10 30 69 OI
11 00 70 OI
11 30 71 I
12 00 72 I
12 30 73 I
13 00 74 OI
13 30 75 O I
14 00 76 O I
14 30 77 O I
15 00 78 O I
15 30 79 OI
16 00 80 O I
16 30 81 O I
17 00 82 OI
17 30 83 OI
18 00 84 OI
18 30 85 I
19 00 86 I
19 30 87 IO
20 00 88 IO
20 30 89 IO
21 00 90 IO
21 30 91 IO
22 00 92 IO
22 30 93 IO
23 00 94 IO
23 30 95 I
0 00 96 IO
0 30 97 IO
1 00 98 IO
1 30 99 IO
2 00100 IO
2 30101 I O
3 00102 IO
3 30103 IO
4 00104 I
4 30105 I
5 00106 IO
5 30107 I
6 00108 I

```
  6 30109      IO
  7 00110      I
  7 30111      I
  8 00112      I
  8 30113     IO
  9 00114     I
  9 30115     I
 10 00116     I
 10 30117     I
 11 00118    IO
 11 30119    I
 12 00120    I
```

1*OVER

STATION 1, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1	1	2	2	2	3	3	4	4	5
5	6	6	6	7	7	8	9	10	11
13	14	15	15	16	17	19	22	27	34
42	53	69	101	160	207	244	267	273	261
240	213	184	157	133	113	95	87	77	71
66	63	63	64	68	74	83	91	100	109
115	123	134	152	177	207	240	273	304	330
352	371	392	433	520	675	914	1440	1831	2330
2953	3635	4303	4839	5154	5184	4921	4461	3942	3414
2909	2458	2089	1778	1522	1309	1135	988	888	785
682	592	530	498	475	457	438	421	404	388
372	358	343	330	317	304	292	280	269	258

STORAGE

0	0	0	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	3	3
3	3	3	3	3	4	4	4	5	6
7	8	10	13	15	17	19	20	20	20
19	18	16	15	14	13	13	12	11	10
10	9	9	10	10	11	12	12	13	13
13	14	14	15	16	17	19	20	21	23
23	24	25	27	31	37	45	51	54	57
61	65	69	72	73	73	72	70	67	64
61	58	56	54	52	50	48	47	44	41
37	33	31	30	29	28	27	26	26	25
24	24	23	23	22	21	21	20	20	20

STAGE

1244 1	1244 1	1244 2	1244 2	1244.2	1244.2	1244 2	1244.2	1244.3	1244.3
1244 3	1244 3	1244 3	1244 3	1244.3	1244.4	1244 4	1244 4	1244 4	1244 4
1244 5	1244 5	1244 5	1244 5	1244.5	1244.5	1244.6	1244.6	1244.7	1244.8
1244 9	1245 1	1245 3	1245 6	1245.9	1246 1	1246 3	1246.4	1246 4	1246 4
1246 3	1246 2	1246 0	1245 9	1245 8	1245.7	1245.6	1245.5	1245.4	1245.3
1245 3	1245 2	1245 2	1245 3	1245.3	1245 4	1245 5	1245.6	1245 6	1245 7
1245 7	1245 7	1245 8	1245 9	1246.0	1246 1	1246.3	1246 4	1246.6	1246.7
1246 8	1246 9	1247 0	1247 2	1247 5	1248 1	1248 9	1249 5	1249 8	1250 1

1250.4	1250.7	1251.0	1251.3	1251.4	1251.4	1251.3	1251.1	1250.9	1250.6
1250.4	1250.1	1249.9	1249.7	1249.6	1249.4	1249.3	1249.1	1248.9	1248.5
1248.2	1247.8	1247.6	1247.4	1247.3	1247.3	1247.2	1247.1	1247.0	1247.0
1246.9	1246.8	1246.8	1246.7	1246.6	1246.6	1246.5	1246.5	1246.4	1246.4

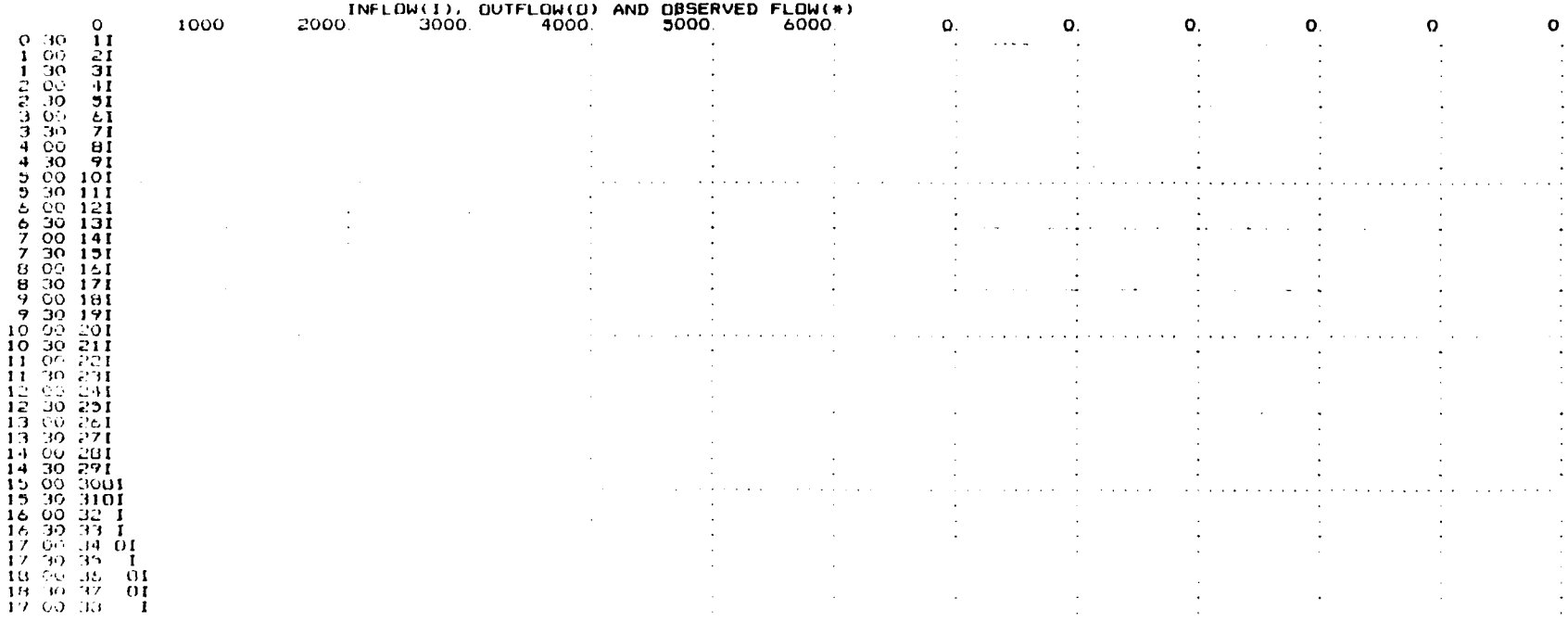
PEAK OUTFLOW IS 5184 AT TIME 43.00 HOURS

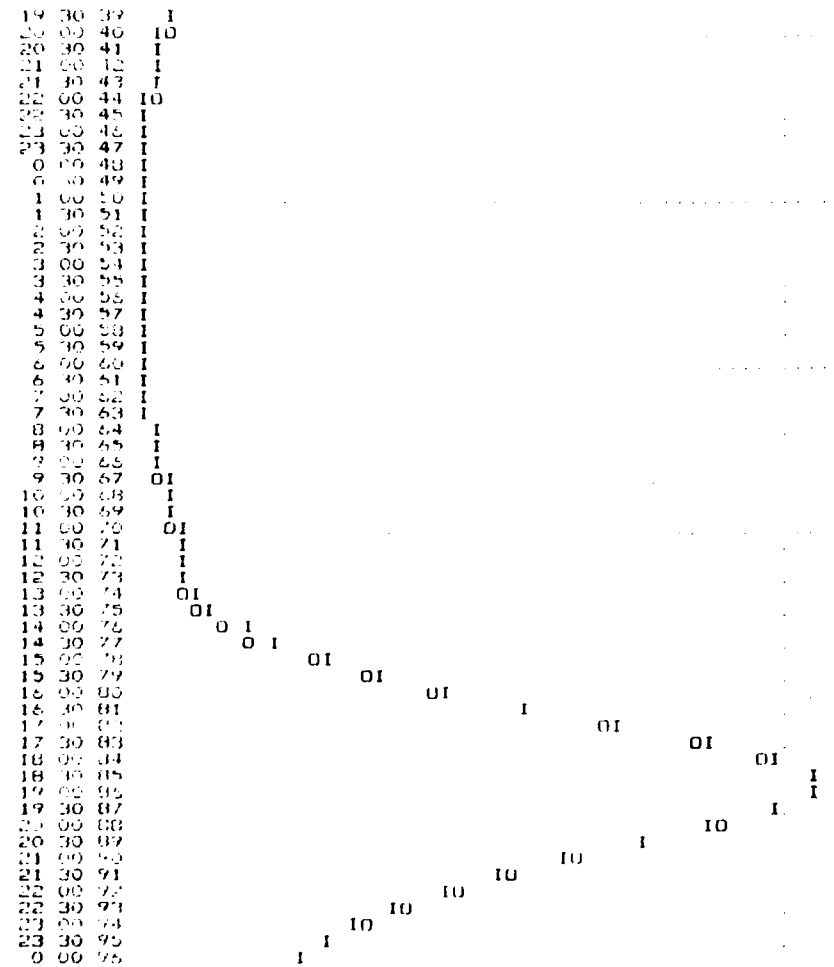
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5184	4009.	1572.	683.	81979.
CMS	147	114	45	19	2321.
INCHES		9.87	15.48	16.81	16.81
MM		250.60	393.08	427.03	427.03
AC-FT		1988.	3118.	3388.	3388.
THOUS CU M		2452.	3846	4178.	4178.

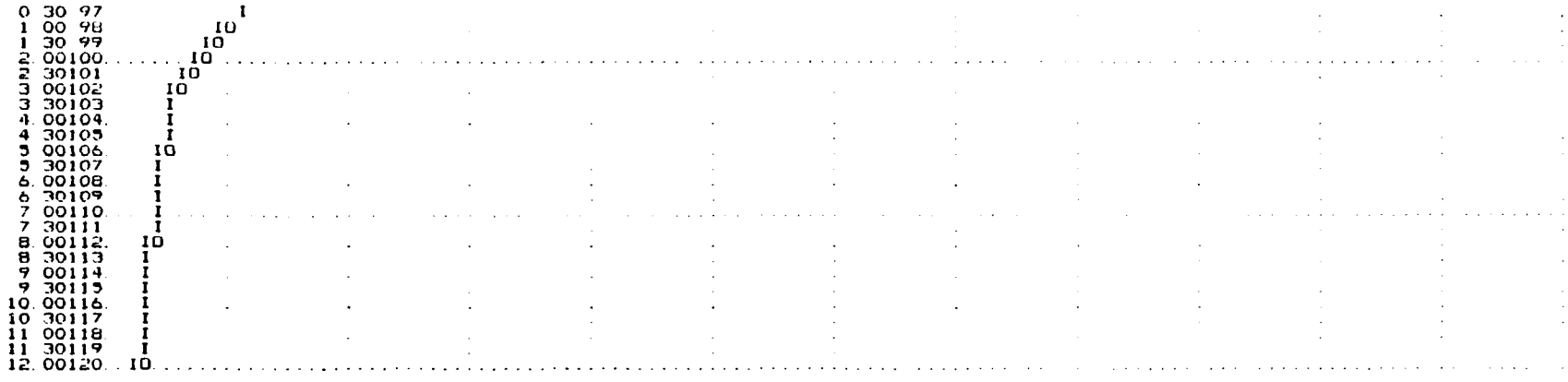
1*OVER

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)







1*OVN*

STATION 1, PLAN 1, RATIO 7

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1	1	2	2	3	3	4	4	5	6
6.	7.	7.	7.	8.	9.	10.	11	13	14
15	16	17	18	19	20	22	26	32	39
49	62	83	135	193	243	285	312	318	305
279	247	215	184	155	131	111	95	87	78
73.	70.	71.	73.	81	90.	101.	114	123	129
135	143	157	178	206	241	280	319	355	385.
411.	432.	457.	507.	612.	792.	1163.	1711	2131	2730.
3440.	4254.	5021.	5651.	6013.	6048.	5739.	5202	4595.	3979.
3391.	2870.	2430.	2073.	1771.	1524.	1315.	1141.	992.	889.
782.	683.	617.	580.	554.	530.	509.	488.	471.	453.
435.	418.	401.	385.	370.	355.	341.	327.	314.	301.

STORAGE

0	0	1	1	1	1	1	1	1	2.
2.	2.	2.	2.	2.	2	3	3	3	3.
3	3	4	4	4	4	4	5	5	6
8.	9.	12.	14.	17.	19.	21	22.	22	22.
20	19	18	16	15	14	13	13	12	11
11	10	10	11	11	12	13	13	14	14.
14	15	15	16	17	19.	20	22	24	25.
26.	27.	28.	30.	34.	41.	49.	53.	56.	60.
64.	68.	72.	76.	77.	78.	76.	73.	70.	67.
64.	61.	58.	56.	54.	52.	50.	48.	47.	44.

40 27	37 26	34 26	33 25	32 24	31. 24	30. 23	29. 22.	29. 22	28. 21.

STAGE

1244 1	1244 1	1244 2	1244 2	1244 2	1244 2	1244 2	1244 3	1244 3	1244 3
1244 3	1244 3	1244 4	1244 4	1244 4	1244 4	1244 4	1244 4	1244 5	1244 5
1244 5	1244 5	1244 5	1244 6	1244 6	1244 6	1244 6	1244 7	1244 8	1244 9
1245 0	1245 2	1245 3	1245 8	1246 1	1246 3	1246 5	1246 6	1246 6	1246 6
1246 5	1246 3	1246 2	1246 0	1245 9	1245 8	1245 7	1245 6	1245 9	1245 4
1245 4	1245 3	1245 3	1245 4	1245 5	1245 5	1245 6	1245 7	1245 7	1245 8
1245 8	1245 8	1245 9	1246 0	1246 1	1246 3	1246 5	1246 7	1246 8	1246 9
1247 1	1247 2	1247 3	1247 5	1247 9	1248 5	1249 3	1249 7	1249 9	1250 3
1250 6	1251 0	1251 4	1251 6	1251 8	1251 8	1251 7	1251 4	1251 2	1250 9
1250 6	1250 3	1250 1	1249 9	1249 7	1249 6	1249 4	1249 3	1249 1	1248 9
1248 5	1248 2	1247 9	1247 8	1247 7	1247 6	1247 5	1247 4	1247 3	1247 2
1247 2	1247 1	1247 0	1246 9	1246 9	1246 8	1246 7	1246 7	1246 6	1246 6

PEAK OUTFLOW IS 6048 AT TIME 43 00 HOURS

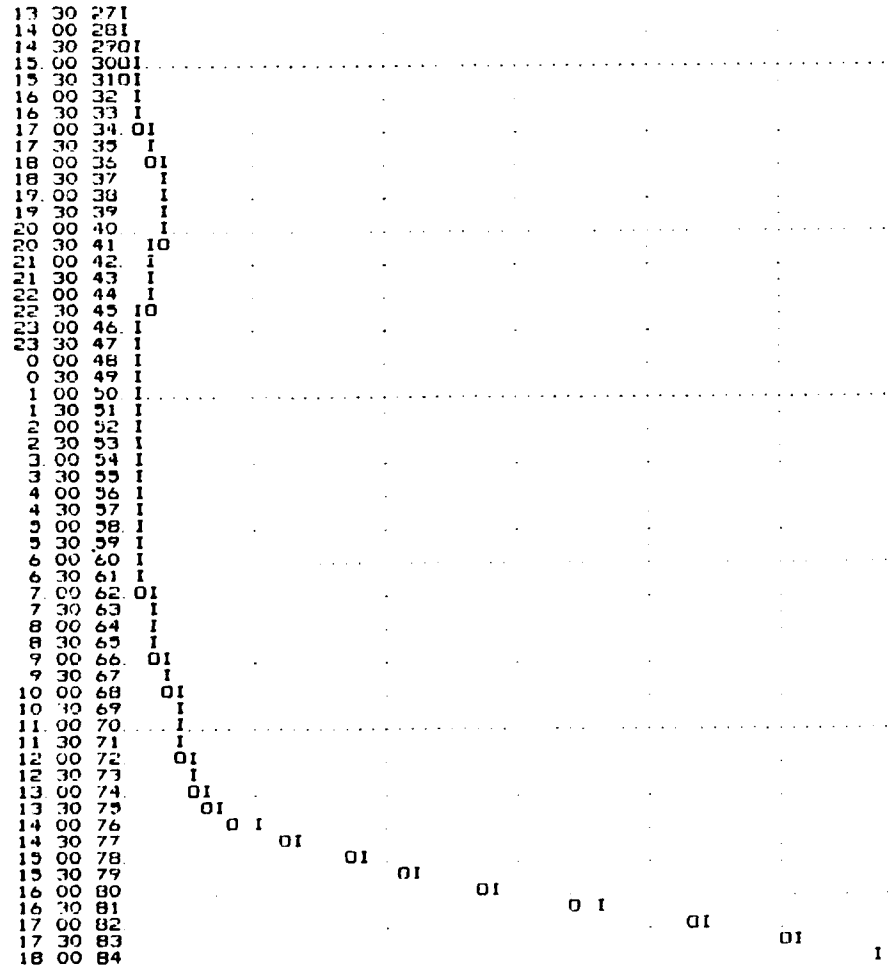
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6048	4677.	1834.	797	95678.
CMS	171	132	52.	23.	2709.
INCHES		11 51	18 05	19 62	19 62
MM		292.38	458.60	498 38	498.38
AC-FT		2319.	3638	3954.	3954.
THOUS CU M		2861.	4487	4877.	4877.

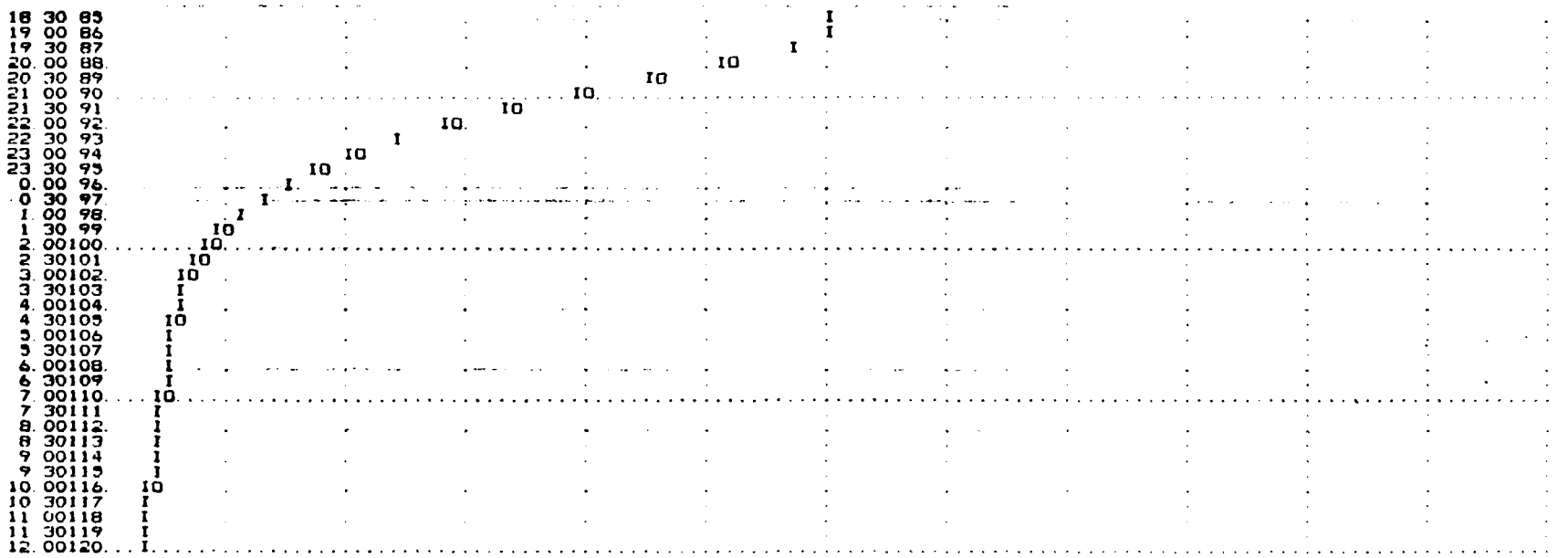
1*OVF*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	1000.	2000	3000	4000.	5000.	6000.	7000.	0.	0	0.	0.	0.
0 30	11												
1 00	21												
1 30	31												
2 00	41												
2 30	51												
3 00	61												
3 30	71												
4 00	81												
4 30	91												
5 00	101												
5 30	111												
6 00	121												
6 30	131												
7 00	141												
7 30	151												
8 00	161												
8 30	171												
9 00	181												
9 30	191												
10 00	201												
10 30	211												
11 00	221												
11 30	231												
12 00	241												
12 30	251												
13 00	261												


13 30 27I
14 00 28I
14 30 29OI
15 00 30OI
15 30 31OI
16 00 32 I
16 30 33 I
17 00 34 OI
17 30 35 I
18 00 36 OI
18 30 37 I
19 00 38 I
19 30 39 I
20 00 40 I
20 30 41 IO
21 00 42 I
21 30 43 I
22 00 44 I
22 30 45 IO
23 00 46 I
23 30 47 I
0 00 48 I
0 30 49 I
1 00 50 I
1 30 51 I
2 00 52 I
2 30 53 I
3 00 54 I
3 30 55 I
4 00 56 I
4 30 57 I
5 00 58 I
5 30 59 I
6 00 60 I
6 30 61 I
7 00 62 OI
7 30 63 I
8 00 64 I
8 30 65 I
9 00 66 OI
9 30 67 I
10 00 68 OI
10 30 69 I
11 00 70 I
11 30 71 I
12 00 72 OI
12 30 73 I
13 00 74 OI
13 30 75 OI
14 00 76 O I
14 30 77 OI
15 00 78 OI
15 30 79 OI
16 00 80 OI
16 30 81 O I
17 00 82 OI
17 30 83 OI
18 00 84 I



1*OVN*

STATION 1, PLAN 1, RATIO 8

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1	1	2	3	3	4	4	5	6	6
7	8	8	9	10	11	12	13	15	16
17	19	20	21	22	23	26	30	36	45
56	71	103	165	224	280	327	357	364	349
319	282	245	210	178	150	127	108	94	86
81	78	79	84	93	108	122	132	141	148
155	164	179	203	235	275	321	365	405	440
469	494	525	583	699	916	1450	1918	2462	3111
3940	4865	5743	6460	6873	6911	6556	5942	5248	4543
3871	3278	2777	2363	2022	1737	1500	1297	1124	974
873	768	700	662	633	606	582	559	536	515
494	476	458	440	423	406	390	374	359	345

STORAGE

0	0	1	1	1	1	1	1	2	2
2	2	2	3	3	3	3	3	3	3
4	4	4	4	4	4	5	5	6	7
8	10	13	16	18	20	22	24	24	23
22	21	19	17	16	15	14	13	12	12
11	11	11	12	12	13	14	14	15	15
15	15	16	17	19	20	22	24	26	27
28	30	31	33	37	43	51	55	58	62
67	72	76	80	82	82	80	77	74	70
66	63	60	57	55	53	52	50	48	46
44	40	37	36	35	34	33	32	31	30
30	29	28	27	26	26	25	24	24	23

STAGE

1244.1	1244.2	1244.2	1244.2	1244.2	1244.2	1244.3	1244.3	1244.3	1244.3
1244.4	1244.4	1244.4	1244.4	1244.4	1244.4	1244.5	1244.5	1244.5	1244.5
1244.5	1244.6	1244.6	1244.6	1244.6	1244.6	1244.7	1244.7	1244.8	1245.0
1245.1	1245.3	1245.6	1245.9	1246.2	1246.5	1246.7	1246.8	1246.8	1246.8
1246.6	1246.5	1246.3	1246.1	1246.0	1245.9	1245.8	1245.7	1245.6	1245.5
1245.5	1245.4	1245.4	1245.5	1245.6	1245.7	1245.7	1245.8	1245.8	1245.9
1245.9	1245.9	1246.0	1246.1	1246.3	1246.5	1246.7	1246.9	1247.0	1247.2
1247.3	1247.4	1247.5	1247.8	1248.2	1248.9	1249.5	1249.8	1250.1	1250.5
1250.9	1251.3	1251.7	1251.9	1252.1	1252.1	1252.0	1251.7	1251.5	1251.2
1250.8	1250.6	1250.3	1250.1	1249.9	1249.7	1249.5	1249.4	1249.2	1249.1
1248.8	1248.5	1248.2	1248.1	1248.0	1247.9	1247.8	1247.7	1247.6	1247.5
1247.4	1247.4	1247.3	1247.2	1247.1	1247.0	1247.0	1246.9	1246.8	1246.8

PEAK OUTFLOW IS 6911. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6911	5346.	2096.	911.	109377.
CMS	196	151.	59.	26.	3097.
INCHES		13.16	20.63	22.43	22.43
MM		334.14	524.11	569.74	569.74
AC-FT		2651.	4158.	4520.	4520.
THOUS CU M		3270.	5128.	5575.	5575.

1*OUT*

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	1000	2000	3000	4000	5000	6000.	7000.	0.	0.	0.	0	0
0:30	1I												
1:00	2I												
1:30	3I												
2:00	4I												
2:30	5I												
3:00	6I												
3:30	7I												
4:00	8I												
4:30	9I												
5:00	10I												
5:30	11I												
6:00	12I												
6:30	13I												
7:00	14I												

```
 7 30 15I
 8 00 16I
 8 30 17I
 9 00 18I
 9 30 19I
10 00 20I
10 30 21I
11 00 22I
11 30 23I
12 00 24I
12 30 25I
13 00 26I
13 30 27I
14 00 28I
14 30 29OI
15 00 30OI
15 30 31 I
16 00 32 I
16 30 33 OI
17 00 34  I
17 30 35  OI
18 00 36   I
18 30 37   OI
19 00 38    I
19 30 39    I
20 00 40   I
20 30 41   I
21 00 42  IO
21 30 43  I
22 00 44  I
22 30 45 IO
23 00 46 IO
23 30 47 I
 0 00 48 I
 0 30 49 I
 1 00 50 I
 1 30 51 I
 2 00 52 I
 2 30 53 I
 3 00 54 I
 3 30 55 I
 4 00 56 I
 4 30 57 I
 5 00 58 I
 5 30 59 I
 6 00 60 OI
 6 30 61  I
 7 00 62  I
 7 30 63  I
 8 00 64  I
 8 30 65  OI
 9 00 66   I
 9 30 67   OI
10 00 68    I
10 30 69    I
11 00 70    OI
11 30 71     I
12 00 72     I
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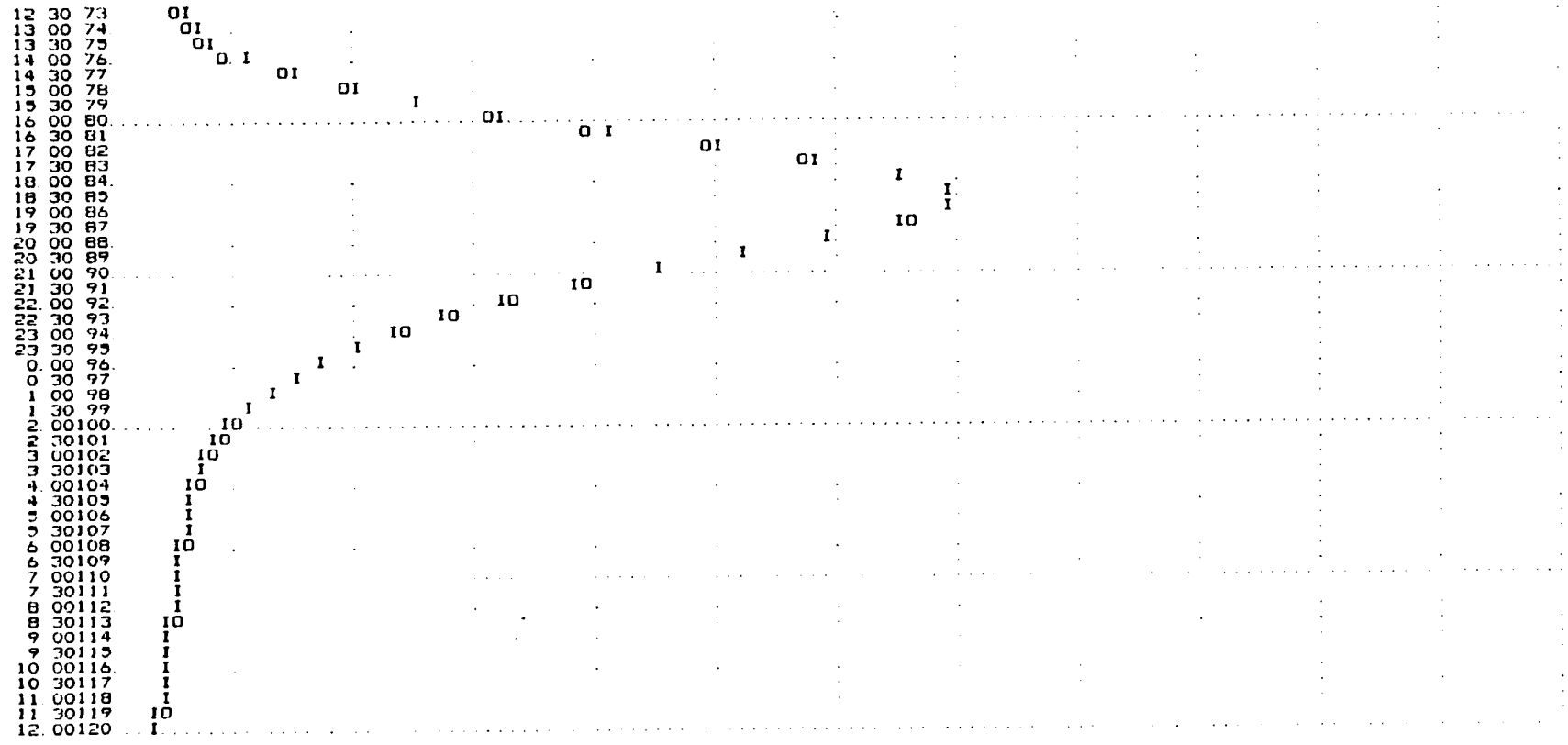


1*OVN*

STATION 1, PLAN 1, RATIO 9

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1	2	3	3	4	5	6	6	7	8
9	11	12	13	14	15	16	17	19	20
22	23	25	26	27	29	32	37	45	56
70	95	153	215	282	352	409	446	454	436
399	354	306	261	222	188	159	135	116	102
94	94	98	109	124	139	154	166	176	185
193	205	224	253	295	345	400	455	507	553
590	621	656	727	887	1302	1831	2406	3085	3888
4943	6086	7188	8081	8596	8637	8190	7420	6555	5671
4831	4090	3470	2954	2518	2167	1867	1615	1394	1200
1029	914	858	819	785	753	726	698	671	644
619	594	570	547	526	505	485	467	449	431

STORAGE

0	1	1	1	1	1	2	2	2	2
3	3	3	3	3	3	3	4	4	4
4	4	4	5	5	5	6	7	8	8
10	13	15	18	21	23	26	27	28	27
25	24	22	20	18	17	15	14	13	13
13	12	13	13	14	14	15	16	16	16
17	17	18	19	21	23	26	28	30	32
33	34	36	39	44	50	54	58	62	66
72	78	83	87	89	90	88	84	80	76
72	68	64	61	58	56	54	52	51	49
47	45	43	42	41	40	39	37	36	35
34	33	32	32	31	30	29	28	28	27

STAGE

1244 1	1244 2	1244 2	1244 2	1244 2	1244 3	1244 3	1244 3	1244 4	1244 4
1244 4	1244 4	1244 5	1244 5	1244 5	1244 5	1244 5	1244 5	1244 6	1244 6
1244 6	1244 6	1244 7	1244 7	1244 7	1244 7	1244 8	1244 8	1245 0	1245 1
1245 3	1245 4	1245 9	1246 2	1246 5	1246 8	1247 1	1247 2	1247 3	1247 2
1247 0	1246 8	1246 6	1246 4	1246 2	1246 0	1245 9	1245 8	1245 7	1245 6
1245 6	1245 6	1245 6	1245 7	1245 7	1245 8	1245 9	1245 9	1246 0	1246 0
1246 1	1246 1	1246 2	1246 4	1246 5	1246 8	1247 0	1247 3	1247 5	1247 7
1247 8	1247 9	1248 1	1248 3	1248 8	1249 4	1249 8	1250 1	1250 5	1250 9
1251 3	1251 8	1252 2	1252 5	1252 7	1252 7	1252 6	1252 3	1252 0	1251 6
1251 3	1250 9	1250 6	1250 4	1250 2	1250 0	1249 8	1249 6	1249 5	1249 3
1249 1	1248 9	1248 8	1248 6	1248 5	1248 4	1248 3	1248 2	1248 1	1248 0
1247 9	1247 8	1247 7	1247 6	1247 5	1247 5	1247 4	1247 3	1247 2	1247 2

PEAK OUTFLOW IS 8637 AT TIME 43 00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8637	6682	2620.	1140.	136773.
CMS	245	189	74	32.	3873.
INCHES		16 44	25 79	28 05	28 05
MM		417 69	655 14	712 45	712 45
AC-FT		3314	5197.	5652.	5652.
THOUS CU M		4087	6411.	6971 .	6971.

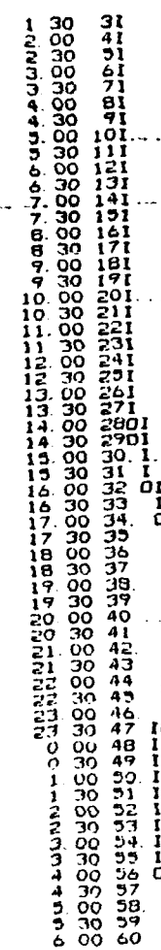
HOUR

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0	1000	2000	3000	4000	5000	6000	7000.	8000.	9000.	0.	0	0.
0 30	II												
1 00	2I												

FLAHERTY GIAVARA ASSOCIATES, P C



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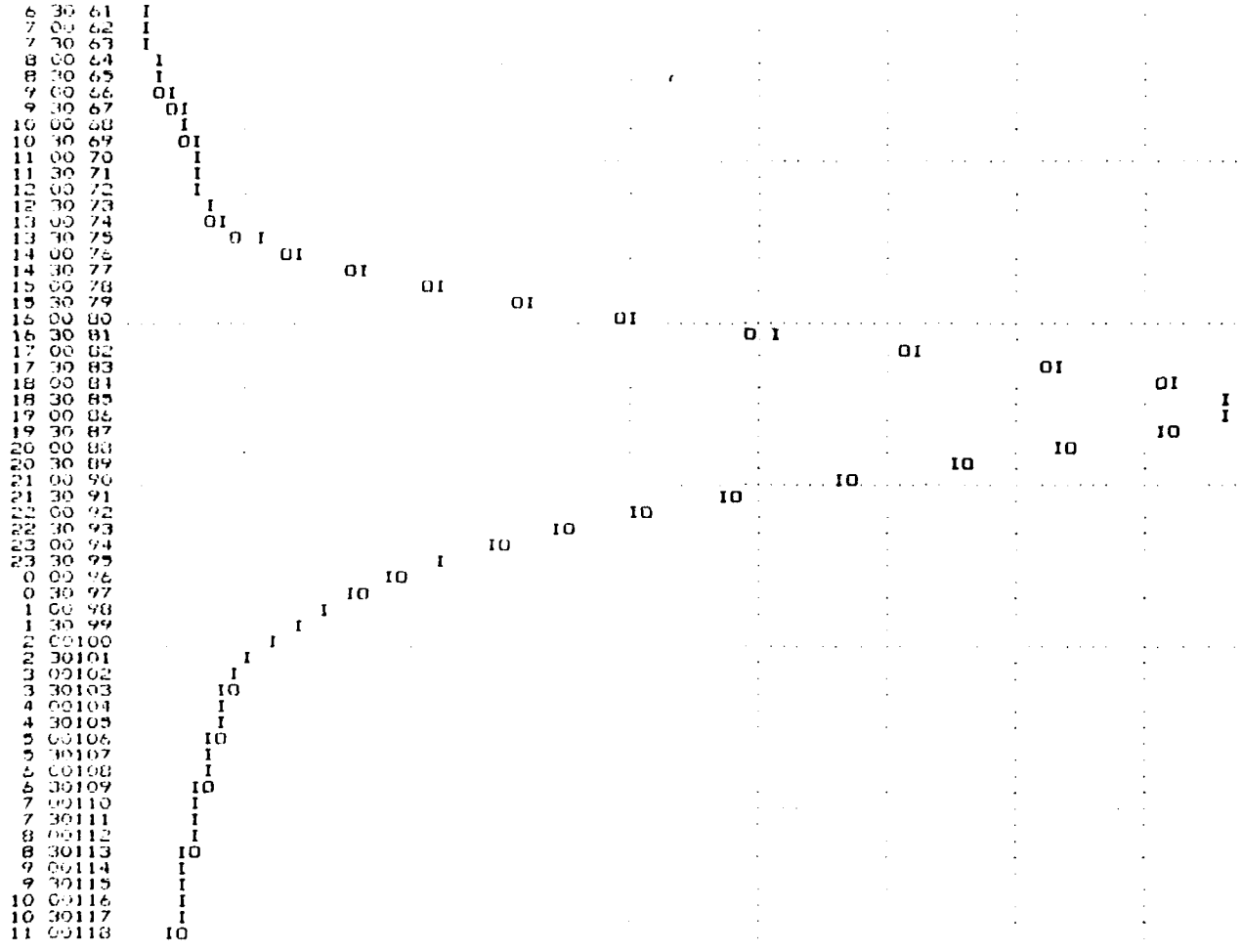
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16 30 81
17 00 82
17 30 83
18 00 84
18 30 85
19 00 86
19 30 87
20 00 88
20 30 89
21 00 90
21 30 91
22 00 92
22 30 93
23 00 94
23 30 95
0 00 96
0 30 97
1 00 98
1 30 99
2 00100
2 30101
3 00102
3 30103
4 00104
4 30105
5 00106
5 30107
6 00108
6 30109
7 00110
7 30111
8 00112
8 30113
9 00114
9 30115
10 00116
10 30117
11 00118

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 11 30119     I
 12 00120     I

1*DVN*

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1
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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 0.10	RATIO 2 0.20	RATIO 3 0.30	RATIO 4 0.40	RATIO 5 0.50	RATIO 6 0.60	RATIO 7 0.70	RATIO 8 0.80	RATIO 9 1.00
HYDROGRAPH AT	1	2.09	1	467.	935.	1402.	1870.	2337.	2804.	3272.	3739.	4674.
	(	5.41)	(	13.24)(	26.47)(	39.71)(	52.94)(	66.18)(	79.41)(	92.65)(	105.88)(	132.36)
HYDROGRAPH AT	1	1.69	1	399.	798.	1196.	1595.	1994.	2393.	2791.	3190.	3988.
	(	4.38)	(	11.29)(	22.58)(	33.88)(	45.17)(	56.46)(	67.75)(	79.04)(	90.33)(	112.92)
2 COMBINED	1	3.78	1	863.	1725.	2588.	3450.	4313.	5176.	6038.	6901.	8626.
	(	9.79)	(	24.43)(	48.85)(	73.28)(	97.70)(	122.13)(	146.56)(	170.98)(	195.41)(	244.26)
ROUTED TO	1	3.78	1	850.	1727.	2592.	3457.	4320.	5184.	6048.	6911.	8637.
	(	9.79)	(	24.07)(	48.90)(	73.38)(	97.90)(	122.34)(	146.78)(	171.26)(	195.70)(	244.56)

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1244.10	1244.10	1249.00
STORAGE	0.	0.	46.
OUTFLOW	0.	0.	934.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	1248.73	0.00	43.	850.	0.00	43.00	0.00
0.20	1249.70	0.70	53.	1727.	5.00	43.00	0.00
0.30	1250.20	1.20	59.	2592.	7.00	43.00	0.00
0.40	1250.64	1.64	64.	3457.	8.50	43.00	0.00
0.50	1251.05	2.05	69.	4320.	10.00	43.00	0.00
0.60	1251.43	2.43	73.	5184.	10.50	43.00	0.00
0.70	1251.78	2.78	78.	6048.	11.50	43.00	0.00
0.80	1252.11	3.11	82.	6911.	12.00	43.00	0.00
1.00	1252.72	3.72	90.	8637.	13.00	43.00	0.00

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1*********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
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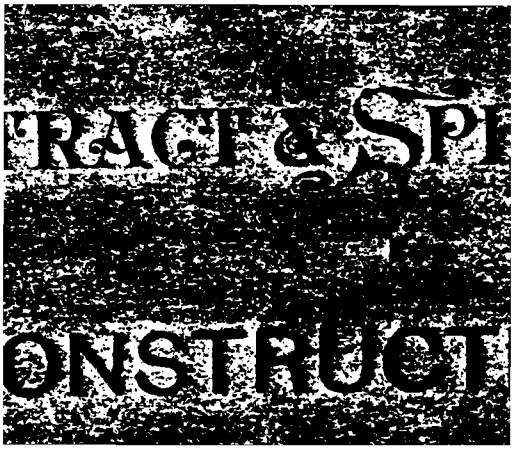
LAST MODIFICATION 26 FEB 79

APPENDIX D

PREVIOUS INSPECTION REPORTS/AVAILABLE DOCUMENTS

EXCERPTS FROM TECHNICAL SPECIFICATIONS


RACT & SPE
ONSTRUCT

THE NORWICH WATER WORKS.

CONTRACT.

THIS AGREEMENT, made the Fourth day of April 1890: Between The Norwich Water Works, of Norwich, New York, party of the first part, and Troy Public Works Company - Limited

party of the second part:

WITNESSETH, That said party of the second part has agreed, and by these presents does agree to and with said parties of the first part, for the consideration hereinafter mentioned, and of the covenants and agreements herein mutually entered into, and under the penalty expressed in a certain bond bearing even date with these presents: to perform, furnish and provide, and deliver to the parties of the first part, at its own proper cost and expense, all the labor and materials of whatever kind, and to execute and perform in the most workmanlike manner, of the best materials, and in the manner, and subject to all the requirements of the Specifications, all the work mentioned, enumerated and called for in the following Specifications, which Specifications are hereby made a part of this agreement and contract:

SPECIFICATIONS.

Description.

The work will consist of the construction of a Storage Reservoir in the town of Norwich, N. Y., and situate above what is now termed "the Storage Reservoir" of the Norwich Water Works aforesaid, and all other work necessary to meet the demands and intent of the plans designed therefor, subject to such modifications as the Engineer may make by reason of unforseen causes or otherwise.

Foundations of all embankments.

All embankments are to be constructed upon a well prepared and solid foundation; and the payment rendered will be deduced from the schedule of prices expressed in the proposal for the various materials excavated, or otherwise constructed therefore, regardless of depth or expanse in any direction. In final, the Contractor should exercise his own judgment, arrange his prices and cover all contingencies by the price designated in the proposal for excavation.

Material for embankments.

The material with which all embankments are to be made, will be such as is best suitable for the purpose intended, and excavated from such points as the Engineer may direct, and in case any or all such material be found to exist within the consequent slopes

necessary to effect the final flow line of the said Storage Reservoir and for By-Pass Canal, shall be paid for in excavation and as otherwise provided, but in case of any excavation being made *outside* of the same, embracing rock and necessary stripping therefore, shall not be paid for in excavation, *excepting material for puddle*, hence the only payment to be awarded to the Contractor in such case, will be that deduced from his or their schedule of prices for the work constructed *in place* with *such borrowed material*. The Norwich Water Works does not guarantee the existence of all necessary material within the limits of the boundaries of its lands.

The Material paid for.

Guarantee.

All material used for the purpose aforesaid shall be deposited properly in courses extending longitudinally with the bank, having a concaved surface transversely so as to retain a depressed surface at point of puddle wall as represented by the plan, and the various courses so applied, must be of approved material, entirely free from all such stone, lumps, roots and foreign matter as will be deemed detrimental by the Engineer, and the said courses must not exceed a thickness of eight inches at the time of deposit, after which, if considered necessary by the Engineer, it must be rolled with a grooved iron roller weighing at least six hundred pounds to the lineal foot, to such extent as to compact the said course to a degree of hardness approved by said Engineer, and should the action of said roller fail to transmit sufficient hardness, or result in rendering an imperfect bond, the material thus rolled must be sprinkled or wetted sufficiently with water, and if necessary, be re-rolled until sufficient compactness is finally attained. The finest and most appropriate material hauled from time to time upon the bank, must be deposited upon the entire width of the front slope, and be extended also upon the rear slope for at least a distance of ten feet from the rear face of the puddle wall. The construction of rear slopes must receive the same care and attention as specified for the front slope. In final, the only difference allowed between the front and rear slopes is that the material built into the outer portion of said rear slope may be coarser and may also contain a greater percentage of stone, but the amount of stone thus placed will be discretionary with said Engineer during the time of construction. Frozen material will be disallowed in every instance, and the amount and payment allowed the contractor for said frozen material will be discretionary with the Engineer.

Formation of the embankment.

Disposition of material in the embankment.

Frozen material.

The face of each and every excavation and borrow-pit must be dressed down and trimmed off so as to produce a good tidy appearance at date of completion, which expense must be covered by the price for earth excavation for material placed in embankment. The final measurements taken by the Engineer of all material having been used, made and placed into the work, will occur upon such dates as he may decide upon, but in no case shall he postpone it unnecessarily, neither shall the Contractor impede the transaction in any form or manner; but on the contrary furnish all facilities, and at times, assistance in obtaining measurements, data, etc. The Reservoir embankment will, so far as possible, be built in conformity with the sections represented by the plans.

Dressing of borrow-pits.

Final measurements, etc.

If necessary, a part, or all of the natural soil, consisting of muck, etc., occupying the area covered by the flow line and embankments, will be hauled into spoil-banks, for subsequent use on the rear slope of said embankments.

Spoil banks.

N. B.—All earthwork will be measured for payment in excavation only, except, that extra payment will be made for puddle, as herein provided.

Measurement for earthwork.

Earth moved more than once is not to be measured a second time, excepting puddling material and muck as herein specified. Preparation of surfaces for complete incorporation of additional material are not to be measured until after having attained a depth of eighteen inches, after which the contract price will be paid.

The supply for the Distribution System, or to the "Distributing Reservoir," will be controlled by valves placed within a masonry Inlet Chamber, provided with a bridge as per plans, thence passing through a twenty-four or twenty-inch cast-iron pipe, as may be decided upon, extending under the embankment; said pipe being thoroughly supported throughout its entire length, and if deemed necessary, a cement masonry wall, or cut-off wall, will be built at its junction with the puddle trench, or as otherwise directed.

Supply, how controlled.

Location of Stop walls.

Puddle trench foundation, width, etc.

The Engineer will designate certain points at which stop-walls, consisting of either cement masonry, concrete, puddle or select material, will be built in under and all around said pipe, in accordance with directions, and number required, and the material so placed, must be executed by *experienced* workmen. The foundation of the puddle trench will be extended down and into a solid and impervious material, and the width at bottom shall be not less than that deemed necessary by the Engineer at the time of construction, which perhaps in no case, will be less than five feet, from which point it will ascend with a variable width, filling every void, situate between said foundation and the original line of the natural surface of the ground, at which point it must be lined into position, also to the proper width, and receive henceforth a batter of about one inch per foot, upon either side of the wall, and terminate with a top width of five feet, at a point situate two feet above the flow line.

Rip-rap.

The slope-lining, or rip rap, will consist of stone either wasted from the excavation pit, or procured otherwise, and the price named in the proposal, is for hauling and placing said material only. Payment for excavation will occur only where the stone is taken from excavation pits.

Surface puddling.

If deemed necessary by the Engineer, puddle will be placed upon the surface of Reservoir bottom; also into crevices, fissures, etc., and in fact every part of the work; but before so doing, all stone, roots, and perishable matter must be thoroughly removed, from the point of application.

Right of changing plans and amount of work.

The amount of work, and the plans therefor may be changed, during the progress of construction, if so ordered by the Engineer; but the contract price shall remain the same, for all *material named* in the schedule of prices.

Approximate quantities.

The approximate quantities of the work to be done, and as stated in the Quantity Sheet *are approximate only*; and the Corporation reserve the right to increase or diminish them as they may deem necessary.

Price bid to include all work and material.

The price bid for each item, is to include the cost of all work and materials incidental thereto, such as bailing, pumping, and draining away water, furnishing all necessary tools, furnishing centers for masonry, furnishing water for all uses, etc., etc. It is intended that this specification shall provide for the full completion of the work above mentioned, ready for use, except as herein specially mentioned; and all labor and materials necessary to that end are to be *included in the items to which prices are attached*.

Crude timber becomes property of Contractor.

All the wood and timber directed to be cut, and herein considered under the head of grubbing and clearing, becomes the property of the Contractor, who must haul it immediately from off the grounds, and deposit all debris of whatever class at points approved by the Engineer.

Skilled labor.

The construction work must be done by competent men, skilled in the capacities assigned them by the Contractor.

Excavation classes.

All excavation is to come under the head of earth or rock; the latter to include all hard rock found in a mass of one cubic yard or more, for which explosives, in the opinion of the Engineer must necessarily be used.

All other material found in excavating, of whatever nature, including disintegrated rock, or any other material that can be removed with picks or bars, shall with the exception of muck, come under the head of earth.

The price for earth and rock excavations shall apply to all trenching and foundations for masonry, puddle, concrete, etc., and permanent earth-work of any description necessary for the construction of the works connected herewith.

Muck.

In case a deposit of muck is found, the Engineer may require its removal to such place as he may indicate. The payment for the same being at the price in proposal per cubic yard.

NEW PICKET FENCING.

Fencing.

A picket fence composed of good seasoned hemlock, free from all detrimental qualities, will, if required, be constructed in conformity with the plan, and upon such lines, directions, etc., as the Engineer may direct. The posts shall be of good, sound chestnut, entirely free from its bark, and have a diameter of at least six inches, midway of tip and butt, and

a length of not less than nine feet, all of which shall be set plumb, at intervals of six feet between centers. The back-filling shall be selected from the excavation made for the post-hole, and should such material fail to provide a sufficient amount to refill around said post, in a permanent and satisfactory manner, it must be taken from the general surface of the ground, and completed in a manner as not to produce a trench or pit-hole. The back-fill must be free of stone and thoroughly rammed with properly constructed rammers, during the operation of refilling.

Dimensions.

The pickets shall be four inches wide at base, three inches wide at top, one and one-quarter inches thick, and six and one-half feet long, spaced at intervals of seven inches apart at centers. They are to be securely nailed to a top, center and bottom rail, being two by four inches wide; and also finished off by a rail at top and bottom, planted upon the pickets in the manner represented by said plan, and the whole to be executed in a good and workmanlike manner. In case it is necessary to grade up or off such material as the engineer may direct in order to maintain a reasonably parallel grade between the base of the pickets and the finished surface of ground line, the same must be done, and the cost thereof must be included in price per linear foot of fence complete.

Gates.

N. B.—At points designated by said Engineer, substantial swing-gates shall be constructed of the aforesaid material.

The necessary hinges, locks, hasps and cross-bars, shall be of approved class and material. The entire set of locks must be of the same pattern; accompanied with duplicate keys, and the cost of said gates per linear foot must be covered by price per linear foot specified in the schedule sheet of prices.

TIMBER BRIDGE.

Material.

At the point designated by the Engineer, a timber farm bridge of the form, span, etc., represented by the plans may be built across the By-Pass Canal, and the material called for and built into said structure, must be of first-class, well seasoned Georgia pine lumber painted in two coats of good mineral paint.

And the material constituting the tie or suspension rods must be of good, pure, soft Swedish iron, upset at ends, upon which threads of the form shown upon the plan will be properly cut.

A Guard Rail, of the form also represented, will be built across both sides of the bridge, and be securely fastened to the string-piece as represented on said plan.

The price for the various classes of material in place, must cover the cost, etc., of every item.

Wrought iron bridge in lieu of timber bridge.

In case it be deemed advisable by the Corporation aforesaid, a wrought iron bridge, represented by "Plan A," will be adopted instead of the timber bridge above mentioned. It shall be fourteen feet wide, and be planked with such material as the Engineer may select from the quantity sheet. All the iron and such parts of the wood work as may be deemed necessary, must be painted in two coats of the best mineral paint.

IRON FOOT BRIDGE.

Iron foot bridge in lieu of timber foot bridge.

In case the said Corporation decide to adopt the wrought iron foot bridge, represented on plan "A", the same shall be constructed in accordance with said plan, and be painted in two coats of good mineral paint, and payment therefor, all in place exclusive of flooring, will be made per lineal foot, and should circumstances necessitate an increase or diminution in its length by reason of shifting the proposed location of the Inlet Chamber,

Adjustment of increase or diminution.

the said additive or deductive amount will be covered and adjusted by the schedule price per lineal foot.

Items compared separately

In canvassing the bids, the price, etc., of the Iron Farm Bridge, Iron Foot Bridge and Gate House upon Inlet Chamber (of corrugated iron siding) *will be compared separately.*

INFLUENT CHAMBER.

The Influent Chamber situate at influent end of the mud pipe proper, may be of the logs cut from the trees obtained from off the site of the work, provided such be accept-

able. It will be of the dimensions represented upon the plans, and the framing will consist in halving the ends to a reasonably fitting joint and be pinned alternately, log upon log, as represented, with wooden pins of hard wood, having a diameter of not less than one and one-half inches.

Frame work of crude material.

The grating will consist of three-quarter inch wrought pipe secured by staples, and the structure back filled with good sized stone of approved form.

The timbers forming the structure must be sound and entirely free from bark, and completed for a lump sum.

Frame work of squared timber

In case squared timber be used, packing blocks must be inserted between said timbers so as to leave a void sufficient for the percolation of water to the mud pipe. In such case the work will be paid for as per schedule price for such material. The Engineer will decide as to which will be used at time of construction.

MASONRY.

Inlet Chamber.

The masonry of the Inlet Chamber must be of a quality that will insure durability and also be impervious to water, the object being to afford the opportunity of descending into the same without drawing off at any time the stored waters of the Reservoir, and will be built according to the plan so far as is practicable, but if in the opinion of the Engineer circumstances necessitate a shift or change from the position represented upon the map, the change so made shall not increase or decrease the prices given in the proposal. The work must be executed by masons skilled in this particular class of work. Inexperienced workmen will not be allowed upon any portion of work falling under the head of Rubble Masonry.

Screen Lugs.

At a point situate about three feet below the central axis of the upper inlet, three iron plugs will be inserted into the fourteen-inch stand pipe sufficiently to project through the shell of said pipe in a manner as to afford a safe and substantial resting place for the basket screen, and the cost of the same must be included with that of setting the stand pipe.

Valve Rods.

The Valve Rods must be securely fastened to the valves by a key, and be extended to the upper surface of the floor, supported throughout their length so as to maintain a plumb position and operate easily, as may be directed by the Engineer at time of construction. The heads of the said rods must have a bearing upon a cast iron collar planted and fastened to the flooring of the Inlet Chamber in such manner as not to extend above the general plane of the surface of said flooring, and the size of each value operated, must be designated with red paint, also the direction for closing, by an arrow plainly scribed upon the floor, and directly opposite the rod for which it is intended.

GATE HOUSE.

Wood Structure.

The Inlet Chamber will be surmounted by a Gate House as represented on the plan. The material used, in case the structure be built entirely of timber, shall be of good seasoned pine, encased upon the outside with sheeting paper of best quality and by two-inch clear lumber, tongued and grooved, planed and wrought in conformity with plans, in a good workmanlike manner. The sides and ceiling on the interior will be sheeted with good sheeting paper and one-inch pine lumber, tongued and grooved, as aforesaid. The floor will consist of good, well-seasoned one-inch pine and one-inch spruce, cross-laid, with proper provisions for trap door, gate rods, etc.

Ceiling.

Floor.

Windows and Doors.

All swing doors shall be provided with good substantial butt hinges, and where necessary good substantial latches and locks appropriate for the purpose and situation. The

The payment to be made for said Lamp Holes will be rendered per lineal foot, *vertical measurement*, from hub of T, with which the same is connected, and shall also include the cost of the frost-wall, material, labor, etc., with exception of the roofing, which shall be paid for per B. M.—as otherwise provided.

BY-PASS PIPE LINE.

Location.

The twelve-inch By-Pass Pipe Line will be commenced at a point situate in the line of twenty-inch mud pipe of the Storage Reservoir, as represented upon the map, from which point it will be extended in a westerly direction around the southerly side of the Distributing Reservoir and be connected with the Pipe Main of the Distribution System in such manner as to admit of a 10-inch Blow-off discharging into the original creek bed.

Blow-off.

Weight of pipe per 18 feet lengths.

The weight of all straight cast pipe used upon said 12-inch By-Pass Line (in market lengths) must not deviate materially from the standard weights quoted by the Warren Iron Foundry, and generally known as "Class A" pipe.

BASKET GUTTER.

If deemed necessary a cobble stone basket gutter will be commenced and extended from and to all such points as the Engineer may designate at the time of construction.

Size of stone.

The stone shall not be more than ten nor less than five inches in their longest dimensions, and be of a material not liable to disintegrate nor crush. They shall be placed upon a ballast of creek gravel or coarse sand, having a depth of about twelve inches, prepared so as to make a depression of eight inches after the stone are rammed and paved into their final position.

Width.

The width of the gutter from out to out, shall be not less than four feet, and the stone used shall be graduated so as to increase in size from centre line toward either side.

Surface of approach.

The surface of the approach to, and into said basket gutter, must be so arranged as to prevent, as far as possible, any undermining effect caused by the water upon the outer courses of said gutter.

Entrance to catch basin.

As the gutter approaches the Catch Basins, it must be so fashioned as to conduct the water properly into said basin, as represented upon the plans

ROCK.

Rock excavation.

In case any solid rock is found within the lines of excavation, it shall, if so ordered by the Engineer, be blasted out to such surfaces as he may direct, and any space so made beyond the grade surfaces of the work shall be properly filled with puddle, or otherwise treated as the Engineer may direct.

No payment will be made for excavations having been extended beyond the lines and limits previously designated by the Engineer.

PUDDLE

Puddle.

The material for puddle shall be the best the excavation affords, and freed from all stones more than an inch in diameter, and from perishable earth; and if in the opinion of the Engineer, different materials require mixing, they shall be intermixed in proper proportions while dry, after which a sufficient quantity of water shall be applied, and the whole well and thoroughly worked up and rammed or cross cut with proper tools operated by men experienced in this particular kind of work, until the layers become sufficiently tough to meet the approval of the Engineer, and be impervious to water.

Contractor to furnish clay, etc., if needed.

Any surface to which the puddle is to be bonded is to be broken up and properly prepared for that purpose. If, in the opinion of the Engineer, it shall be needful to mix any clay or other material not found in the excavation, into the puddle, such material shall be furnished and delivered on the ground by the Contractor who shall incorporate it properly with the puddle, without extra charge.

Puddle, how applied.

The puddle shall be applied in horizontal layers, not exceeding six inches in thickness. Each six-inch layer shall be allowed to attain a proper consistency, but not dry, before another layer is applied; and if any portion of a layer shall have become hard and dry before the application of the following one, it shall be thoroughly broken up, watered and prepared, so as to insure a sufficient connection with the subsequent layer.

Puddle covered.

The finished surface shall be temporarily covered, when necessary, to prevent cracking from exposure to the sun or detrimental action of the frost.

Measurement of puddle.

All material falling under the head of puddle shall be measured in place, complete, and no allowances shall be made for *shrinkage*.

CEMENT.

Cement and its inspection.

All cement furnished by the Contractor for the entire work herein specified will be subject to inspection and rigorous tests, and, if found of improper quality, must be immediately removed from the work; and the character and severity of the tests are to be determined by the Engineer. It shall be of the best quality of American Hydraulic Cement, freshly ground, and must be packed in substantial barrels of material and workmanship as will protect the contents from water and air. When stored, it shall be kept in a tight building, free from draughts of air, and each cask must be raised several inches above the ground, by blocking or otherwise, so as to avoid the liability of absorbing moisture.

The particular brand to be used will depend upon the tests made by the Engineer with various specimens of cement mixed with the various sands found within the neighborhood of the works and the village of Norwich, and having decided upon which brand forms the best compound, the Contractor will be held to the same without any modification of schedule price or extras, and he or they shall use the same as directed.

MORTAR.

Mortar for stone masonry.

The mortar for the stone masonry shall be prepared by properly mixing one part of clear cement, well compacted, of the quality before described, and two parts of loose, sharp sand, *all by measure*.

Sand.

The sand shall be as clean, sharp and free from loam and frost as the section of country will admit. The cement shall be thoroughly mixed dry with sand, in the proportion of one part of cement to two parts of sand.

Water.

Clean water shall be added at such time, and in such quantity as to make a paste of the best quality and of proper consistence.

The whole shall be thoroughly worked with proper tools, in suitable boxes made for the purpose.

Mixed fresh.

The mortar shall be mixed fresh for the work in hand, and any mortar that may have been left standing long enough to "*begin to set*," shall not be used.

The ratio of sand and cement must be in accordance with experiment made by the Engineer, and should he consider a greater proportion of cement necessary the same shall be done without any extra charge.

CONCRETE.

Concrete.

The concrete shall be formed of sound and acceptable stone, either screened from gravel or broken so as to be not more than two and one-half inches in greatest dimension. The material shall be cleaned from frost, dirt and dust before being used, be properly wet, and thoroughly mixed with mortar in suitable boxes, in such proportions that the volume of mortar shall always be slightly in excess of the volume of voids in the broken stone.

2½-inch stone.

Proportions.

The mortar used in concrete is to be such as above described for stone masonry, viz: one part cement to two of sand, or the proportions may be derived from test as aforesaid. The concrete is to be quickly placed in layers of about six inches in thickness, and thoroughly rammed with suitable rammers until the mortar flushes to the surface.

Rammed.

Not disturbed.

No walking or working upon its surface will be allowed while the mass is setting, and sufficient time must elapse before any succeeding work is allowed to be laid upon it.

All classes of work subject to injury from the action of frost, must be properly protected therefrom by the Contractor without extra charge.

RIP RAP.

After the bank is carried up sufficiently, the inner slope will be dressed true to a line given by the Engineer, and a layer of stone, averaging about fifteen inches in thickness, will be

Rip rap.

applied. The stone used for this purpose must be sound, and shall be hand placed if required. Any additional depth of stone above that of fifteen inches will be allowed, provided the same be so placed as not to produce warped surfaces, but the additional depth so placed shall not constitute an extra price.

RUBBLE MASONRY.

Classification.

The rubble masonry will be divided into two classes, viz: first and second, and the class adopted for the various structures will be designated by the Engineer at the time of construction, the probability being that the only structures built of the first class will be the Inlet Chamber and the Waste Weir, each of which may embrace both classifications.

Distinction between 2nd and 1st class.

Both classifications will embrace *equally good stone*, the difference being that all face-work of the structures above mentioned, shall be stone assorted for the purpose, and in general receive a better degree of care and attention as regards fitness to perform the duty imposed upon them.

RUBBLE—First Class

The stone used will be of any formation that will not disintegrate, they shall have the property of being hammered or pitched, if necessary, to a line, and admit of being scabbled on

Jointage.

bed and builds in order to obtain a satisfactory joint, the thickness of which will depend somewhat upon the size of the particular stone being set, which in no case shall be laid so as to admit of no mortar between it and the adjacent stones. In final, the joint must not be more than three-quarters, nor less than one-quarter, of an inch.

Beds, etc.

The stone must be perfectly clean and laid upon a properly prepared bed of mortar with its *best bed down*, and in no case shall spalls or any other medium be driven in for the purpose of leveling its upper bed. In the preparation of the bed, all chips and spalls used for the purpose must be carefully hand-laid and be hammered down until the mortar flushes to the surface, and when doing likewise with the larger stone, a wooden block must be employed. Regular

Courses.

courses are not to be called for, further than to approach it sufficiently to produce a good bond and a harmonizing effect, approved by the Engineer, more attention being paid to the said bond throughout the whole thickness of the walls than to regular courses.

Rods, ladders, etc.

The insertion of anchor rods, ladders, etc., must be carefully set so as not to admit of any percolation of water. All dowels must be set in sulphur

Projections.

All projections on the face side of the work exceeding two inches, must be scabbled off prior to setting the stone, and in no case shall any stone be set so as to form an inverted batter. After the work becomes sufficiently set for the purpose, the Contractor will clean out the joints

Re-pointing.

of all such work as may be designated by the Engineer, and re-point the same with rich mortar, to the satisfaction of the Engineer.

How measured.

Masonry of all classes are to be measured in the work only, excepting such as are otherwise provided for.

COPING.

The material for coping must consist of either good sound blue stone, or stone quarried at Oxford, N. Y. They will be "rock-faced," neatly pitched to parallel lines, and laid to a joint not to exceed three-eighths of an inch, and be bonded back into the masonry walls as represented upon the plans, and laid in good, rich cement mortar, mixed especially for the purpose. All imperfect stone, also stone having endured long exposure to the natural elements, etc., or discolored thereby, will be rejected.

The material called for in cases of spillways, bridge seats, etc., shall consist of equally good stone and workmanship.

How measured.

All coping will be measured by the cubic yard in place as per quantity sheet, and no extra payment will be made for dimensions exceeding those upon the plan.

PAVEMENT IN CEMENT MORTAR.

Arrangements.

The stone used for all slack-water basins will be of good substantial material, regardless of color, but practically similar in length They are to be carefully arranged in place, upon a properly prepared bed, as per plans, and wedged, rammed, etc., until becoming positively fixed

PREVIOUS REPORTS

RECEIVED
MAY 6 1914
DIVISION INLAND WATERS
Chief Engineer

(NOTICE.—After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK
CONSERVATION COMMISSION
ALBANY

RECEIVED
MAY 8 1914
DIVISION INLAND WATERS
J. D. M.

DAM REPORT
No. 2

April 9, 1914.
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the The Norwich Water Works Dam. No. 2.

This dam is situated upon the Ramford Brook (Give name of stream) in the Town of Norwich, Chenango County, about 9000 feet (State distance) from the Village or City of Norwich. The distance down (Up or down) stream from the dam, to the Chenango River (Give name of nearest important stream or of a bridge), is about 9000 feet (State distance).

The dam is now owned by The Norwich Water Works (Give name of owner) and was built in or about the year 1891, and has been constantly maintained and is in good order. ~~during the year~~.

As it now stands, the spillway portion of this dam is built of masonry (State whether of masonry, concrete or timber) and the other portions are built of earth with clay core (State whether of masonry, concrete, earth or timber with or without rock fill).

As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is rock and under the remaining portions such foundation bed is rock a-b. Earth b-c

The total length of this dam is 638 feet. The spillway or waste-weir portion, is about 45 feet long, and the crest of the spillway is about 5' - 4" feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: 36" main pipe with one 20" and 3 - 14" inlets

State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

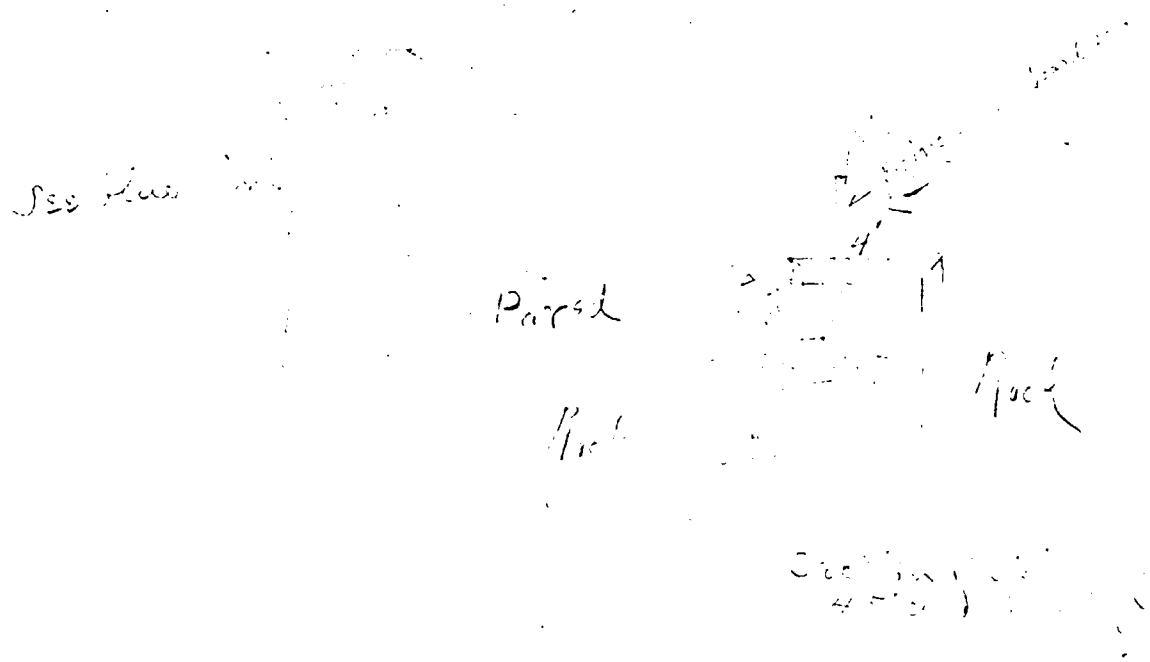
Reported by [signature]
(Signature)

173 Broad
(Address—Street and number, P. O. Box or R. F. D. route)

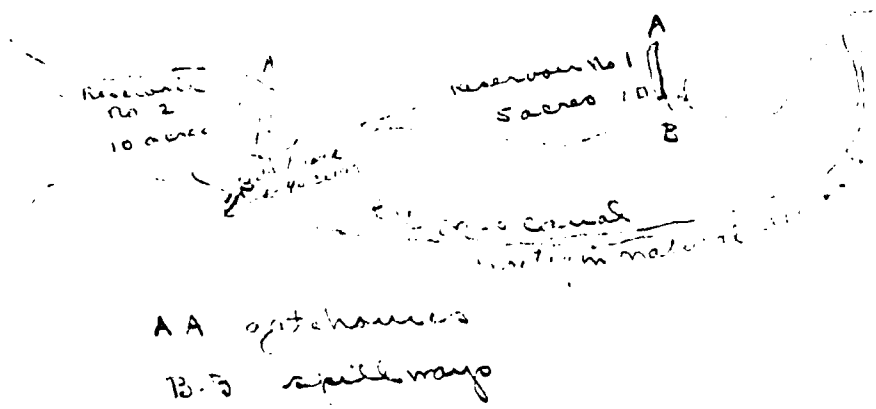
Norwich NY
(Name of place)

(SEE OTHER SIDE)

(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

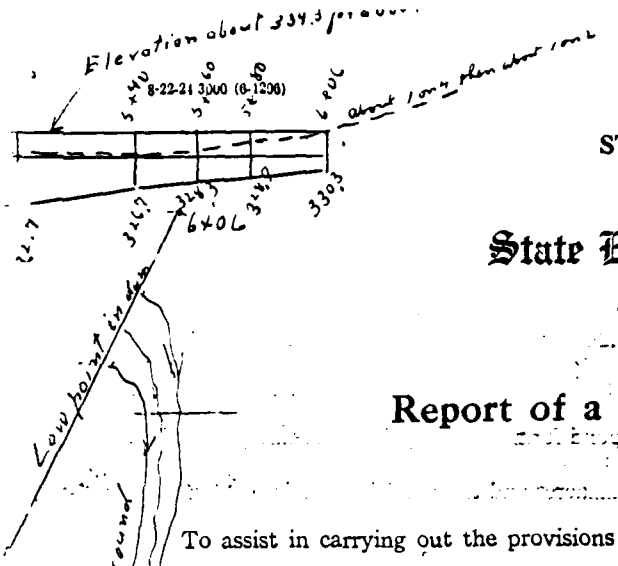


(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.



AA cut-channels

B-B spillways



621

STATE OF NEW YORK Reservoir No 2

DEPARTMENT OF

State Engineer and Surveyor

ALBANY

Report of a Structure Impounding Water

To assist in carrying out the provisions of Section 22 of the Conservation Law, being Chapter LXV of the Consolidated Laws of New York State, relating to safeguarding life and property and the erection, reconstruction, or maintenance of structures for impounding water, owners of such structures are requested to fill out as completely as possible this report form for each such dam or reservoir owned within the State of New York for which no plans or reports relative thereto are on file in this Department, and to return this report form, together with prints or photographs explanatory thereof to this department.

1. The structure is on Ramsford Creek flowing into Chenango River in the Town of Norwich County of Chenango and about 8000 feet from the mouth of the Stream on the City Line
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Is any part of the structure built upon or does its pond flood any State lands? No

3. The name and address of the owner is The Norwich Water Works.
Norwich N.Y.

4. The structure is used for Impounding Water Supply used in the City of Norwich

5. The material of the right bank, in the direction with the current, is Rock with earth above the top of dam; at the spillway crest elevation this material has a top slope of about 6 inches vertical to a foot horizontal on the center line of the structure, a vertical thickness at this elevation of about 10 feet, and the top surface extends for a vertical height of about 16 feet above the spillway crest.

6. The material of the left bank is hard pan; has a top slope of about 3 inches to a foot horizontal, ~~a thickness of~~ for a short distance then much steeper, Cut off wall in Natural Bank 10 ft deep and a height of about 400 feet.

7. The natural material of the bed on which the structure rests is (~~clay, sand, gravel, boulders, granite, shale, slate, limestone,~~ etc.) Limestone and Hard pan
Shale rock

8. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. The rock on the right bank is somewhat laminated, in the bottom, dense, the hard pan dense and impervious Rock disintegrates to some extent by exposure to the air. There has been no leakage from the reservoir during the 35 years since constructed

9. If the bed is in layers, are the layers horizontal or inclined? horizontal If inclined what is the direction of the horizontal outcropping relative to the axis of the main structure and the inclination and direction of the layers in a plane perpendicular to the horizontal outcropping?

10. What is the thickness of the layers? Varying

11. Are there any porous seams or fissures? Some on the right bank but all cut-off by concrete and clay puddle

12. The watershed at the above structure and draining into the pond formed thereby is about 5 square miles.

13. The pond area at the spillway crest elevation is about 8 acres and the pond impounds about 8 million cubic feet of water.

See note on page 3

14. The maximum known flow of the stream at the structure was ? cubic feet per second on May and Sept? 1890 (Date)

15. Has the spillway capacity ever been exceeded by a high flow? No

Can any possible flood flow from the pond otherwise than through the wastes noted under 17 and 18 of this report? Yes If so, give the location, the length and the elevation relative to the spillway crest and the character and slopes of the ground of such possible wastes (See plan on page 4) For about 100 feet the bank, or dam, is from 6 inches to 1 foot lower than the crest of the main dam and an overflow there would follow a natural grassed bank, entirely away from the structure and discharge into Reservoir No 1. See sketch on separate sheet attached

16. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the above structure. Describe the location, the character and the use of buildings below the structure which might be damaged by any failure of the structure; of roads adjacent to or crossing the stream below the structure, giving the lowest elevation of the roadway above the stream bed and giving the shape, the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground below the structure. There are 5 houses and a small school house in a rather narrow valley, also 3 other houses and farm buildings as the valley opens to the river valley. Also a stone arch bridge (See sketch) and a steel bridge on the river road and a highway in the river valley near the work. The land is used for grazing and cultivation

17. WASTES. The spillway of the above structure is 43 feet long in the clear; the waters are held at the right end by a masonry wall the top of which is 6 feet above the spillway crest, and has a top width of 2.5 feet; and at the left end by ~~a~~ the Dam, the top of which is 6 feet above the spillway crest, and has a top width of 2.5 feet.

18. There is also for flood discharge a pipe 36 inches inside diameter and the bottom is 4.0 feet below the spillway crest; and a (sluice, gate outlet) 3 feet wide in the clear ~~by~~ diameter feet high, and the bottom is 4.0 feet below the spillway crest.

19. APRON. Below the spillway there is ~~an apron built of~~ Rock bottom channel with sides (Material)

~~45 feet~~ wide and ~~unknown~~ feet thick. ~~The down stream side of the apron has a thickness of~~ ~~in.~~

for a width of 45 feet.

20. Has the structure any weaknesses which are liable to cause its failure in high flows? No.

21. SKETCHES. On the back of this report make a sketch to scale for each different cross-section of the above structure at the greatest depth; giving the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spillway at two feet below the crest), the elevation of the top in reference to the spillway crest, the length of the section, and the material of which the section is constructed; on the spillway section show a cross section of the apron, giving its width, thickness and material, and show the abutment or wash wall at the end of the spillway, giving its heights and thickness. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; the abutments by their top width and top lengths from the upstream face of the spillway section; and outline the apron. Also sketch an elevation of each end of the structure with a cross section of the banks, giving the depth and width excavated into the banks.

22. WATER SUPPLY. The waters impounded by the above structure have (~~not~~) been used for a public water supply since 1891 by The City of Norwich (Formerly Village)

Note! During the construction of this work and before the completion of the work cut in the bottom of the puddle trench, I think in the early part of May, 1890 a very heavy rainfall caused a flood that passing over the spillway of Reservoir No. 1 which is 45 feet long and 5 feet deep, was 3 feet deep.

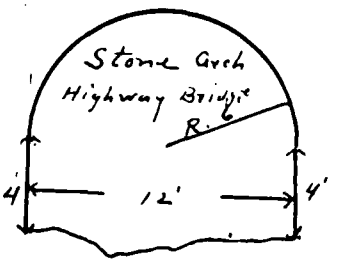
Again about Sept. 1 of the same year, when the bank was 15 feet high a very heavy rain storm filled the pond to the top, but did not overflow but very little if at all. This storm all passed through about 200 feet of 36 inch pipe and filled the lower spillway to about the same depth as the earlier storm. The level of water 50 feet up stream was 3 feet above the top of the spillway.

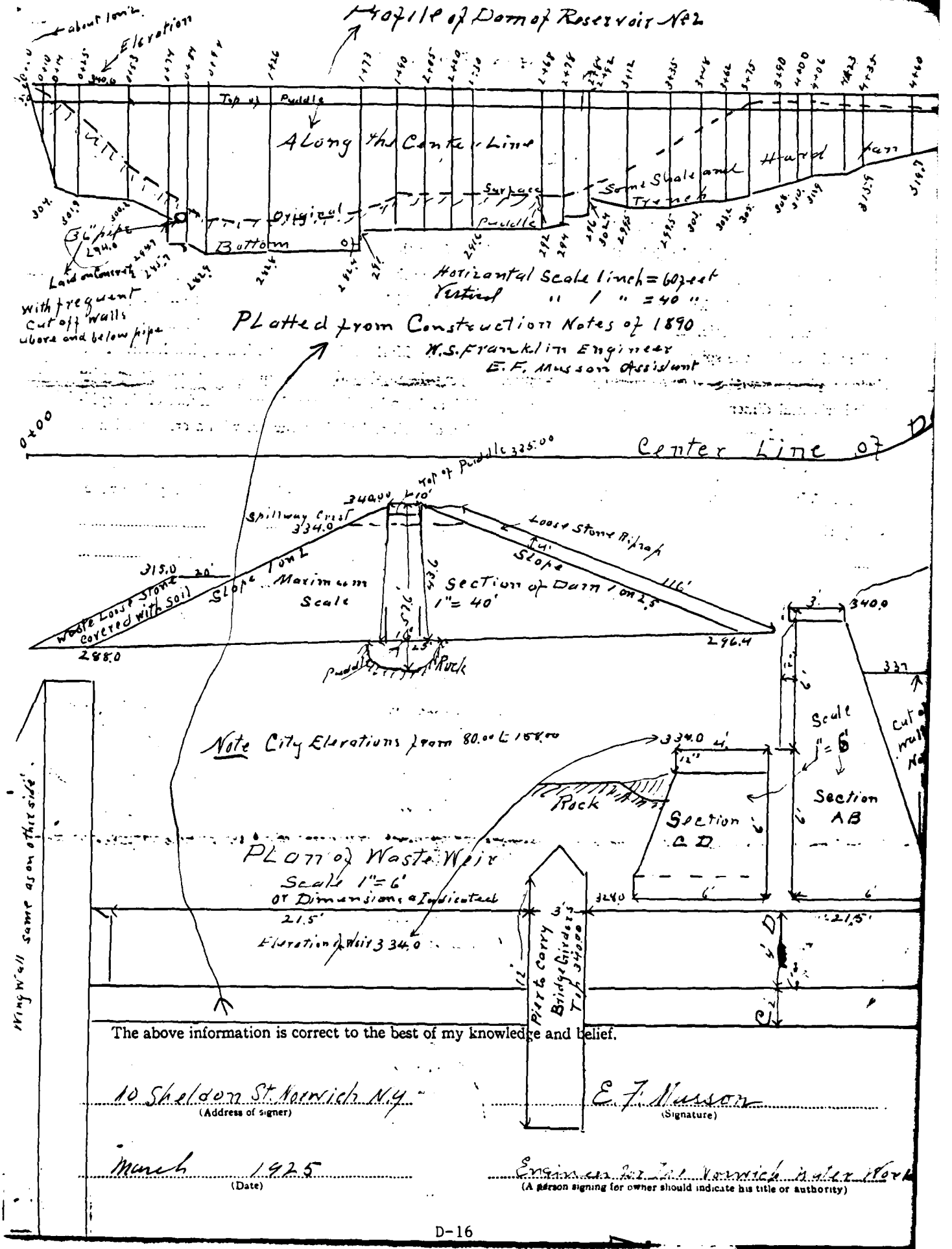
These discharges have never been equalled during the 35 years, to the knowledge of the writer, who was assistant engineer at the time of construction for the preceding 10 years before and since the construction of Reservoir No. 1.

E. F. Musson.

I have received from the U.S. Weather bureau data concerning the precipitation at Oxford, 8 miles south for May and Sept. of 1890 as follows

May		May		Sept.	
4	.68	10	.86	9	.10
5	.57	11	.10	10	3.04
6	1.12	13	1.20	11	.81
		14	1.17	12	.39
				13	1.36





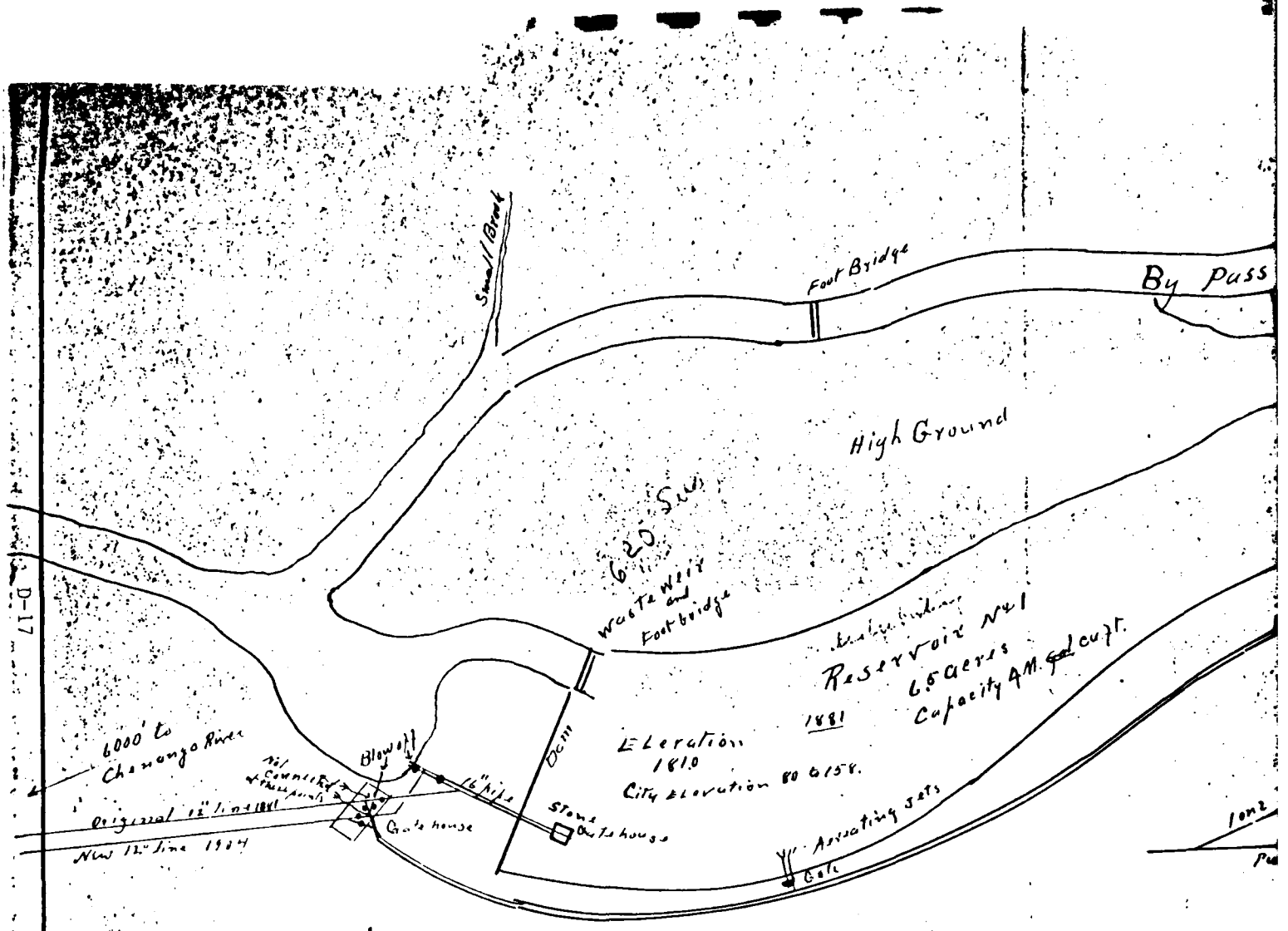
The above information is correct to the best of my knowledge and belief.

10 Sheldon St Norwich N.Y.
(Address of signer)

E. F. Musson
(Signature)

March 1925
(Date)

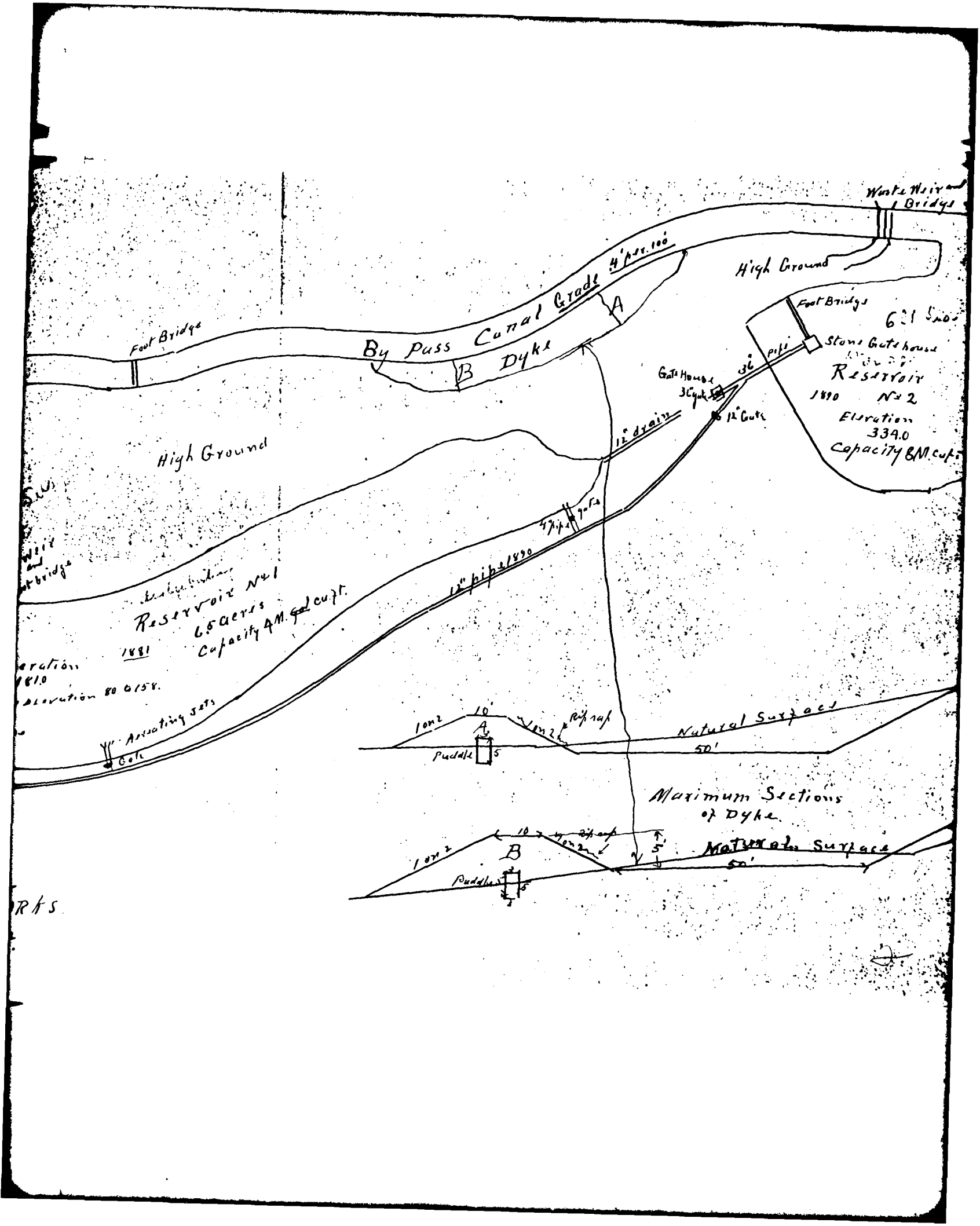
Engineer for Norwich Water Work
(A person signing for owner should indicate his title or authority)



Sketch Map of the Reservoirs of The Norwich Water Works.

Scale 1 inch = 200 feet.

D-17


Waste Weir and Bridge
High Ground
Foot Bridge
By Pass Canal Grade 4' per 100
A
B Dyke
Foot Bridge
6.21 Sno
Stone Gate house
Reservoir
1890 No 2
Elevation
334.0
Capacity BM cuft
Gate House
36" pipe
3 Gate
12" Gate
12" drain
High Ground
Weir and Bridge
Reservoir No 1
6.6 acres
Capacity 4M. gal cuft.
1881
12" pipe 1890
4" pipe
Gate
Natural Surface
50'
Puddle
Maximum Sections of Dyke
B
Natural Surface
50'
Puddle

M. AM. SOC. C. E.
(RESIGNED)
E. F. Musson
Civil Engineer
OFFICE AND RESIDENCE 10 SHELDON ST.

NORWICH, N. Y., April 16, 1925.

Department of State Engineer and Surveyor,
Albany, N.Y.
Gentlemen;-

As requested by your department, I enclose herewith reports concerning the two earth dams and appurtenances owned by The Norwich Water Works of this City.

That designated as Reservoir No.1, was constructed in the year 1881. The informationin regard to that has been mainly obtained from preliminary plans prepared before the construction, together with some measurements of parts that are now accesable and readily measured.

Since the construction of Reservoir ~~of~~ No. 2, it has been in use as a distributing reservoir, the overflow ~~overflowx~~ from reservoir No. 2 passing in a by-pass canal.

The supply from reservoir is discharged into reservoir No. 1through aereating jets., In times of heavy rains when the water in No.w is roilythis is shut off till the water is in good condition for use.

The elevations used in the construction of both reservoirs are derived from an arbitrary bench mark near the center of the City, the elevation of which is assumed as ~~xxx~~ 100.814. and is located on the top of the water table at the North East corner of the Congregational Church.

Reservoir No2 was constructed in the year 1890. The Hon Richard W. Sherman was engaged with Mr. McDonough in the Troy Public Works Co. as contractors. Mr W.S. Franklin was Engineer in charge, with the writer as assistant. The information contain-in the report concerning this reservoiris from the original construction notesand drawings used in the computations for the fin al estimate.

During the construction of this work there were two very unusual storms, as noted on the report. These figures were obtained as noted from the Weather Bureau at Tthaca, N&Y&

Owing to the very heavy rainfall that occured in May it was decided to install a waste pipe 36 inches in diameterin place of one of 20 inches. This was cast iron, asphalt coated and very carefully laid both as to line and grade. It was laid on a masonry wall with several cut off stops extending on each side and over the pipe, extra precaution being taken where the pipe crosses the puddle trench, the masonry extending down several feet to the rock as excavated in the trench.

At the timeof the heavy rainfall that occuredfrom Sep 9 to 13, the top of the dam was at about elevation 315. The 36 inc pipe was 192 feet in lenghh, the elevation at the lower endwas 2~~9~~9x 290.34 and at the upper end 296. The water rose above the dam

M. AM. SOC. C. E.
(RESIGNED)
E. F. Musson
Civil Engineer
OFFICE AND RESIDENCE 10 SHELDON ST.

NORWICH, N. Y.,

to the top thereof and I think overflowed a very little where a slight trench had been dug where less damage would doubtless resulted thanwould likely been done otherwise. Of course there was quite a large quantity of water impounded above the dam which would materially reduce the rate of discharge over the waste weir at reservoir No. 1. I am not at all satisfied with such computations as I have made from the lower weir and of the 36 inch pipe,but the facts are as stated and I leave any further computations for you to take up if you so desire.As stated in the report,at the time of the latter storm the water in the reservoir No. 1was 3 feet above the top of the weir at a point 50r more feet Back from the weir.

Mr. Sherman agrees with me as to the conditions at the dam at the time,except that he thinks the dam was about 30 feet above the pipe at the time,but as I have the original notes of construction at hand which show the elevation Sept.18 as at 313 and Oct.18 as 320,it would appear that 315 was about right.

Precipitation records have been kept by the writer for the past 16 years.Only twice during those years has there been a precipitation of over 3 inches in 24 hours,and in each case there has not been a discharge of 3 feet over the waste weir of res. No. 2, I should have stated that the water shed between the two reservoirs is probably less than 1/2 mile.

Trusting the information I have been able to furnish will meet your requirements,I remain
very truly yours E. F. Musson

Engineer for The Norwich
Water Works

P.S.

We have a tracing of the entire area occupied by both reservoirs and adjacent teritory as shown on the little map enclose This is drawn to a scale of 1 inch = 40 feet and if you desire will send you a blue print.(We have no facilities for cloth prints)

ENGINEERS' REPORT
TO THE
NEW YORK WATER POWER AND CONTROL COMMISSION
ON THE
NEW YORK WATER SERVICE CORPORATION
FOR THE
CITY OF NORWICH, NEW YORK

GENERAL AND HISTORICAL NOTES

The following description of the water supply system for the City of Norwich, New York has been compiled from information made available by the Company and the State Public Service Commission together with the results of various inspections in recent months by Parker & Hooker. The data are mostly as at the date of July 1, 1946 and closely show the property as of the present date since only minor work has been done since June, 1946.

The Norwich Water Works, so-called, was incorporated January 30, 1881. Plant construction was started early in 1881 and the first water service was given in January 1882. On November 16, 1926, the New York Water Service Corporation acquired the old company and changed the name to Norwich Water Service Corporation. On May 7, 1929 the system was merged into the New York Water Service Corporation, and is now commonly known as the Norwich Plant of that Corporation.

The Corporation furnishes water to domestic, commercial and industrial customers and gives fire protection by water service, in the City of Norwich and in parts of the Towns of Norwich, immediately adjacent to the easterly and westerly corporate limits of the City.

SOURCES OF SUPPLY

There are two sources of water. The first is about four square miles of drainage area along Mansford Creek in the Towns of Norwich, North Norwich and New Berlin, beginning about 1.5 miles northeast of the City of Norwich as will be seen from the accompanying U. S. Geological Survey topographic maps. In this drainage area are the two reservoirs first built, known as the "Upper" and "Lower". The Lower Reservoir has a surface area of about 6.5 acres, a maximum depth of about 30 ft. and a storage capacity of 32 million gallons, for 15 feet draw-down. Spillway elevation is 1188 feet above sea-level compared with about 1015 ft. for the center of the City. The Upper Reservoir is immediately upstream and has a surface area of about 9.1 acres, a maximum depth of 40 ft. and a storage capacity of 56.5 million gallons for a draw-down of 30 ft. The spillway here has an elevation of 1242 ft. or 54 ft. above the Lower Reservoir.

The second source of supply is Chenango Lake, in the Town of New Berlin about 3.5 miles northeast of the Lower Reservoir already mentioned.

The drainage area of Chenango Lake is contiguous to that of Ransford Creek and is about 0.8 square mile in extent. The lake surface is about 150 acres, and the normal elevation is 1760 ft. The drainage area has been developed to be contributory to the first area described, but it originally was part of the drainage area of Great Brook and the Unadilla River. Lake waters not used for Norwich water supply still flow out to Great Brook. The Company, by purchase of the lands and water-rights of Chenango Lake and releasing upland cottage rights, has retained a strip of lake shore mostly 16.5 ft. wide. This strip is continuous around the lake except for a few inconsiderable totaling about 1900 ft. of shore, as shown on an appended map. The Corporation obtained the right to raise the water level to a given height two feet above the prior normal level and to draw it down five feet below prior level. This gives a potential storage of 540,000,000 gallons when it can be utilized. The normal realized storage is from 200 to 250 million gallons. The old natural outlet at the south end of the lake was plugged, and an artificial spillway channel opened up at the north-west end into a different branch of Great Brook. To divert the lake water into Ransford Creek, a tunnel 761 ft. long was driven through the ridge separating the two basins and a pipe line of 14, 16 and 18 inch cast iron pipe was run another 9587 ft. to connect the Lake and Creek with the tunnel. Water from the Lake runs 8,000 ft. in open brook channel to the Upper Reservoir already described.

OTHER LANDS

The Company owns about 270 acres of land around the reservoirs and Ransford Creek as shown in the accompanying maps. This has been replanted with about 177,000 evergreen trees. To improve the appearance around the two reservoirs, about 3100 shrubs have been planted.

There is a tract of about 7 acres on the south side of the New Berlin Highway in the Town of Norwich just east of the Chenango River and the City of Norwich. Here is located the filtration plant. On the opposite bank of the river, in the City of Norwich, is a corresponding tract of about 10 acres held undeveloped.

The Chenango Lake tunnel and the approach pipe lines are under a strip of land 50 ft. wide owned in fee. The balance of the lake to creek line is on easements. The Company owns easements to extend the lake delivery line through to the Upper Reservoir and has rights to the waters of Ransford Creek.

There is a private right of way about 4700 ft. long for two 12-inch cast-iron transmission mains leading down from the Lower Reservoir. This parallels the New Berlin highway. The two mains cross under the high-way for another 1200 ft. to the filtration plant just outside the City as already noted. From the filtration plant, one 12-inch cast-iron main runs mostly under public ways into the Town and City of Norwich to River and Rexford Streets where it becomes a part of the distribution grid. A 10-inch cast-iron delivery line also runs on private lands about 1200 ft. from the filtration plant to River and to Rexford where it joins the distribution system. All river crossings are on private lands.

The distribution system is laid almost entirely under public streets. There is a length of about 350 ft. on a private easement near Broad and American Streets. South of the D.L. & W. R.R. at Front and Thompson Streets is a 600 ft. stretch. Near Elm and Beebee Streets are two lengths aggregating about 500 ft. West of the end of East Main Street is a stretch on private right of way to River Road across the Chenango River.

STORAGE FACILITIES

Lower Reservoir. The dam at the Lower Reservoir was built in 1881. It is an earth embankment with puddled core. The maximum height is 30.3 ft. and the length is 240 ft. The top width is 12 ft. The upstream slope is 2.5 to 1 with a broken stone pavement and the downstream slope is 2 to 1 with a seeded soil top. The spillway is formed by a concrete and masonry weir, or overflow section, 45 ft. long between two wing walls of stone and concrete masonry 6.5 ft. wide, 2.8 ft. high and 45 ft. long. The spillway discharges into the old creek channel. The spillway approach and apron are paved with heavy stone. The intake at this reservoir is a 24-inch cast-iron standpipe with three 12-inch intake gates at different levels, all enclosed in a masonry tower. A "mud pipe," or drain, of 16-inch cast-iron pipe, 230 ft. long extends through the bottom of the dam and terminates in a dry masonry head-wall at the outlet end.

Upper Reservoir. The dam at the Upper Reservoir was built in 1891; it is an earth embankment with puddled core, 615 ft. long with a maximum height of 50.5 ft. and a top width of 16.5 ft. The upstream slope is 2.5 to 1 with 18 inches thickness of stone rip-rap. The downstream slope is 2 to 1 with seeded soil top. The spillway is a concrete weir, or overflow section, 45 ft. long, between wing walls, 2.5 ft. wide, 2.5 ft. high and 48 ft. long. The spillway has a cut-off wall extending 7 to 12 ft. below the flow line. The side walls extend 5.5 to 7. ft. below the flow line. The spillway's approach channel and downstream apron are paved with heavy stone. The spillway discharges into a by-pass channel which has been dug past both reservoirs and empties into the old creek bed.

In 1914, counterweighted flashboards were installed on the spillway of the Upper Reservoir dam so as to raise the water level 2.5 ft. These boards are of 2" by 8" plank built in two sections. They are lifted by four hand wheels working through racks and pinions from a bridge above the spillway. This bridge is formed by two 8" I-beams with a 4" yellow-pine floor.

The upper intake is a 14-inch cast-iron pipe with a copper screen, protected by a masonry chamber which is topped with a frame structure and connected to the dam by a 65 ft. short tunnel with wood floor. A 20 to 30-inch cast-iron "mud pipe," or drain, 278 ft. long, runs under the bottom of the dam from a influent chamber (this chamber is 7 x 7 x 4 ft. with a top grill of 3/4 inch iron bars). The chamber and is protected by a 7 x 7 x 4 ft. masonry wall.

A 12-inch cast-iron by-pass line about 2,000 ft. long extends from the 36-inch outlet pipe of the Upper Reservoir below the dam, along the south side of the Lower Reservoir and connects into the two 12-inch transmission lines leading to the City. At a point about 150 ft. upstream from the lower dam is a 12-inch cast-iron pipe lateral leading to 15 jet aerator nozzle. Normally water from the Upper Reservoir is discharged through this jet into the Lower Reservoir.

A caretaker's two story frame house on rubble stone foundations is located opposite the Upper Reservoir. Adjacent to it is a one-story frame barn and a one-story garage.

Chenango Lake. The outlet dam at Chenango Lake is a block of concrete and masonry across an open cut previously made to supply a mill. Through the block is a 24-inch sleeve with sluice-gate and floor stand. Over this is a timber cover and around it is a steel-wire mesh fence, 7 ft. high. The Chenango Lake outlet consists of a 10 ft. riser of 14-inch cast-iron pipe, topped with a copper basket screen, 6 ft. high. The outflow is controlled on the shore by a 14-inch gate valve in box.

ADEQUACY OF SUPPLY

The Company records show conclusively that over periods of time aggregating several years, the described sources (exclusive of the use of Chenango River water which was used for a short time as an emergency supply) have supplied an average of 2 million gallons per day or more. (In the earlier days the consuption was excessive due to general lack of customers' meters and to the use of inadequately regulated sewer flush tanks.) The supply of 2 million gallons per day or more was maintained in spite of the fact that storage on Ransford Creek amounts to only about 90 million gallons, or 45 million per square mile of drainage area, which is rather low.

However, we have investigated a dam and reservoir site on the south branch of Ransford Creek above the Upper Reservoir. The drainage area is approximately 2 sq. mile, and there appear to be many suitings in the area. At a point about 1400 ft. above the present Upper Reservoir dam can be constructed to impound 150 to 200 million gallons of water. With this development, it is estimated that the present sources of supply, as enumerated, will be able to supply an increased consumption at least as great as can be foreseen for a long time in the future.

PURIFICATION WORKS

Filtration Plant. From 1882 to 1905 the supply of water was delivered to customers without purification or treatment. In the latter year, the Company installed four horizontal-tank rapid-sand pressure filters, at the site which has been described as south of New Berlin highway adjacent to the Chenango River [illegible] City. Two additional horizontal-tank rapid-sand pressure filters were [illegible] 190[illegible]. The pressure tanks are 8' in diameter by 40' long. The [illegible] were made by the New York Continental Jewell Filtration Company and [illegible] contains 8 cu. yds. of gravel with 16 cu. yds. of [illegible] sand.

The secondary buildings at the filtration plant site include the following: (1) Storage barn; 1 story frame structure with ridge roof and gable ends, clap board sides, ruberoid roofing on 2" sheeting. One barn section is 30 by 24 ft. and 20 ft. high to roof peak; a second section is 30 by 16.2 ft. and 17.5 ft. high; a third section is 16 by 16.2 ft. and 14 5 ft. high. (2) Sand Storage Bin; a Shiplap bin 9 by 20 ft. by 6.3 ft. with ruberoid roof, painted outside. (3) Hydrant & Hose House; 1 story frame structure 6 by 8 by 6.3 ft. and 9 ft. high to roof peak. Has concrete foundation, ruberoid roof and batten door; contains a 6" hydrant with 2 hose nozzles and steamer connections, and 350 ft. of 2-1/2" fire hose and nozzle. (4) There is a gravel drive, 12 ft. wide into the grounds and around the rear. There is 1300 ft. of 3-strand wire fencing on wood posts.

Chemical House at Lower Reservoir. On the south side of the Lower Reservoir near the dam is a chemical feed house. This is a hollow tile building, 16.3 by 24.3 ft. and 14 ft. high to roof peak. The foundation is of concrete and the building has a basement. The roof is of wood frame with asphalt shingles. The house is heated by a cast-iron boiler and 7 wall type radiators. There are 6 electric outlets. There is located here a Wallace & Tiernan automatic chlorinator, Type "AS", with 1" copper delivery piping to the main outlet, and a 500 lb. platform scale. There is also a Wallace & Tiernan dry-feed alum machine driven by a 10-inch water wheel. A chemical feed line of 4-inch cast-iron pipe leads to the outlet below the lower dam.

Farm Drainage Purification. To meet the requirements of the State Department of Health and to prevent farm sewage on the Ranalord Creek drainage area from getting into the collected waters, the Company has built and maintains on the Pollett, Bixby, Hudson, Skinner, Cooley and Anderson farms, steel septic tanks 38 by 48-ins. each with asphalt cover and an average of 75 ft. of 4-in. tile drain.

MAINS, SERVICES, VALVES, HYDRANTS

Transmission Mains. The transmission mains, as so classified by the Company, are shown in the following list, as of July 1, 1936.

18"	Pit-Cast Iron Pipe	784 L. Ft.
16"	" " " "	1734 "
14"	" " " "	7002 "
12"	Wrought Iron tar coated	137 "
12"	Pit-Cast Iron Pipe	13106 "
10"	Bell & Socket Cast Iron Pipe	480 "
10"	Pit-Cast Iron Pipe	456 "
8"	Centrifugal Cast Iron Pipe	14 "
6"	Pit-Cast Iron Pipe	15 "
6"	Centrifugal Cast Iron Pipe	50 "
	Total length	23738 "

The following are facts [illegible] to the properties owned by [illegible]

1881 - Norwich Water Works incorporated January 11, [illegible] Board of Trustees of the Village of Norwich [illegible] Franchise to lay and construct necessary pipes in and along village streets.

Water Company purchased lands along Ransford Creek to build and impound waters of this creek, and contract let for building Reservoir No. 1 (Lower) holding about 30,000,000 gallons, and for laying 12" transmission main to Rexford and Silver Streets. The original contract and the Franchise are on file in the Water Office. The record shows that approximately 3,800 feet of this 1881 line were laid in the highway (State Route 23).

All riparian rights in the waters of Ransford Creek from the reservoir location to the Chenango River and necessary rights of way for the 12" line were also purchased. A record of these purchases and the deeds are also on file in the Water Office.

1890
1891 Additional lands east of Reservoir No. 1 purchased and Reservoir No. 2 (Upper) constructed to hold approximately 60,000,000 gallons. Original contract on file in the Water Office. Both dams have puddled cores (clay) and working drawings of both are on file in the Water Office.

A 12" line is laid from the 36" waste line of the Upper Reservoir, around the south side of the [illegible] from which 1 4" and 3 3" inlets can be [illegible]

The [illegible] together with [illegible]

1904 - A second 12" transmission main was constructed to the Village, and this line is interconnected with the first 12" (1881) line so that the city supply can be delivered from either reservoir or both. This new line was reduced to 10" west of the Filter Plant and was laid under the river (as was the 1881 line) and up Gold Street to Silver.

1900 - The Norwich Water Works paid Colonel Edwin Loomis the sum of $15,000.00 to raise the level of Chenango Lake and draw down the waters thereof a maximum of 7'. Contract let to lay intake pipe and outlet line (including 750' of 4' rockout tunnel) in Towns of New Berlin and North Norwich to the headwaters of Ransford Creek. Rights were also purchased from other lake front owners to raise lake level and rights of way to lay outlet line.

1919 - Sale (on mortgage foreclosure) by National Bank & Trust Co. of Norwich to the Norwich Water Works of all the lands in Town of New Berlin owned by late Colonel Loomis including approximately 111 acres of the 135 acres total surface of Chenango Lake.

The standing timber on the Loomis Lands sold to [illegible] Cottage lots surveyed and mapped on east, south and west sides of lake.

1904-1905 Filter Plant land purchased in 1904 and Filter Plant [illegible] with four units installed in 1905 [illegible] with a filtering capacity of [illegible] Chemical treatment began using solutions of [illegible] for clarifying and hypochlorite of lime solution for pre-[illegible] Operation with laboratory control under the supervision of

PREVIOUS INSPECTION REPORTS

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DAM INSPECTION REPORT
(By Visual Inspection)

Mohawk Rds T2

Dam Number	River Basin	Town	County	Hazard Class*	Date & Inspector
621	Sosg	Noxon	Chenango	B +	7/16/75 KJH GLE

Type of Construction

- [x] Earth w/concrete spillway
- [ ] Earth w/drop inlet pipe
- [ ] Earth w/stone or riprap spillway
- [ ] Concrete
- [ ] Stone
- [ ] Timber

Use

- [x] Water Supply
- [ ] Power
- [ ] Recreation
- [ ] Fish and Wildlife
- [ ] Farm Pond
- [ ] No Apparent Use-Abandoned

Estimated Impoundment Size

- [ ] 1-5 acres
- [x] 5-10 acres
- [ ] Over 10 acres

Estimated Height of Dam above Streambed

- [ ] Under 10 feet
- [ ] 10-25 feet
- [x] Over 25 feet

Condition of Spillway

- [x] Service satisfactory
- [ ] In need of repair or maintenance

- [x] Auxiliary satisfactory
- [ ] In need of repair or maintenance

Explain: _____

_____

Condition of Non-Overflow Section

- [x] Satisfactory
- [ ] In need of repair or maintenance Explain: _____

_____

Condition of Mechanical Equipment

- [x] Satisfactory
- [ ] In need of repair or maintenance Explain: _____

_____

Evaluation (From Visual Inspection)

- [x] No defects observed beyond normal maintenance
- [ ] Repairs required beyond normal maintenance

*Explain Hazard Class, if Necessary _____

_____

APPENDIX E

REFERENCES

REFERENCES

1. Chow, Ven Te, Editor - Handbook of Applied Hydrology. McGraw-Hill Book Company, New York, New York, 1964.

2. Hydrologic Engineering Center, U.S. Army Corps of Engineers, HEC-1 Flood Hydrograph Package, Users Manual. Davis, California, January 1973.

3. Hydrologic Engineering Center, U.S. Army Corps of Engineers, Flood Hydrograph Package (HEC-1), Users Manual for Dam Safety Investigations, Davis, California, September 1978.

4. King, Horace and Brater, Ernest. Handbook of Hydraulics, 5th Edition. McGraw-Hill Book Company, New York, New York, 1963.

5. Riedel, J.T., Appleby, J.F. and Schloemer, R.W. Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1000 Square Miles and Durations of 6, 12, 24, and 48 Hours (Hydrometeorological Report No. 33) U.S. Department of Commerce - Weather Bureau and U.S. Department of the Army - Corps of Engineers, Washington, D.C., April 1956

6. U.S. Department of the Interior, Bureau of Reclamation, Design of Small Dams, Second Edition, Washington, D.C., 1973.

APPENDIX F

DRAWINGS

CROSS SECTIONS OF STORAGE RESERVOIR EMBANKMENT.

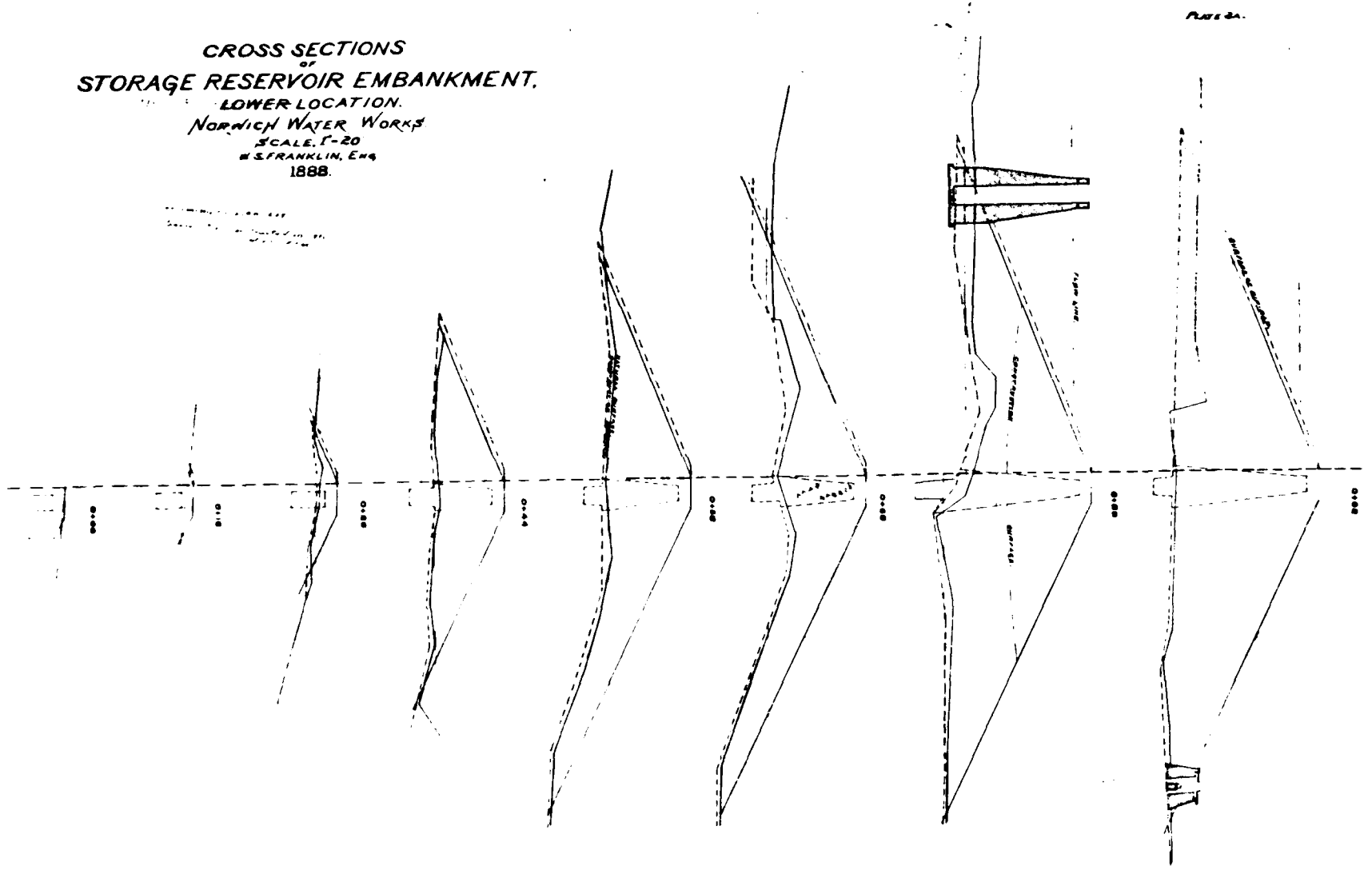
LOWER LOCATION.

NORWICH WATER WORKS

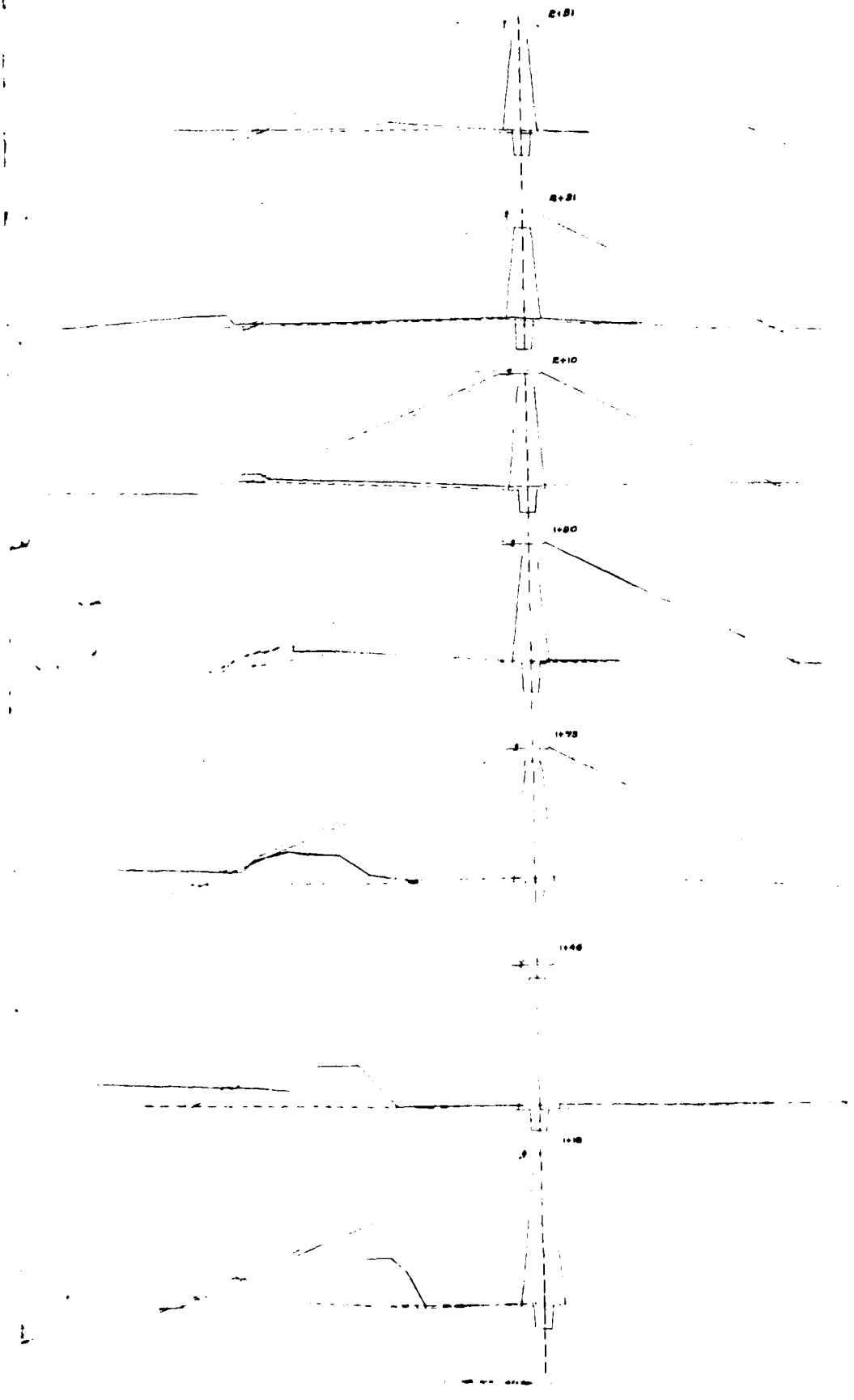
SCALE, 1-20

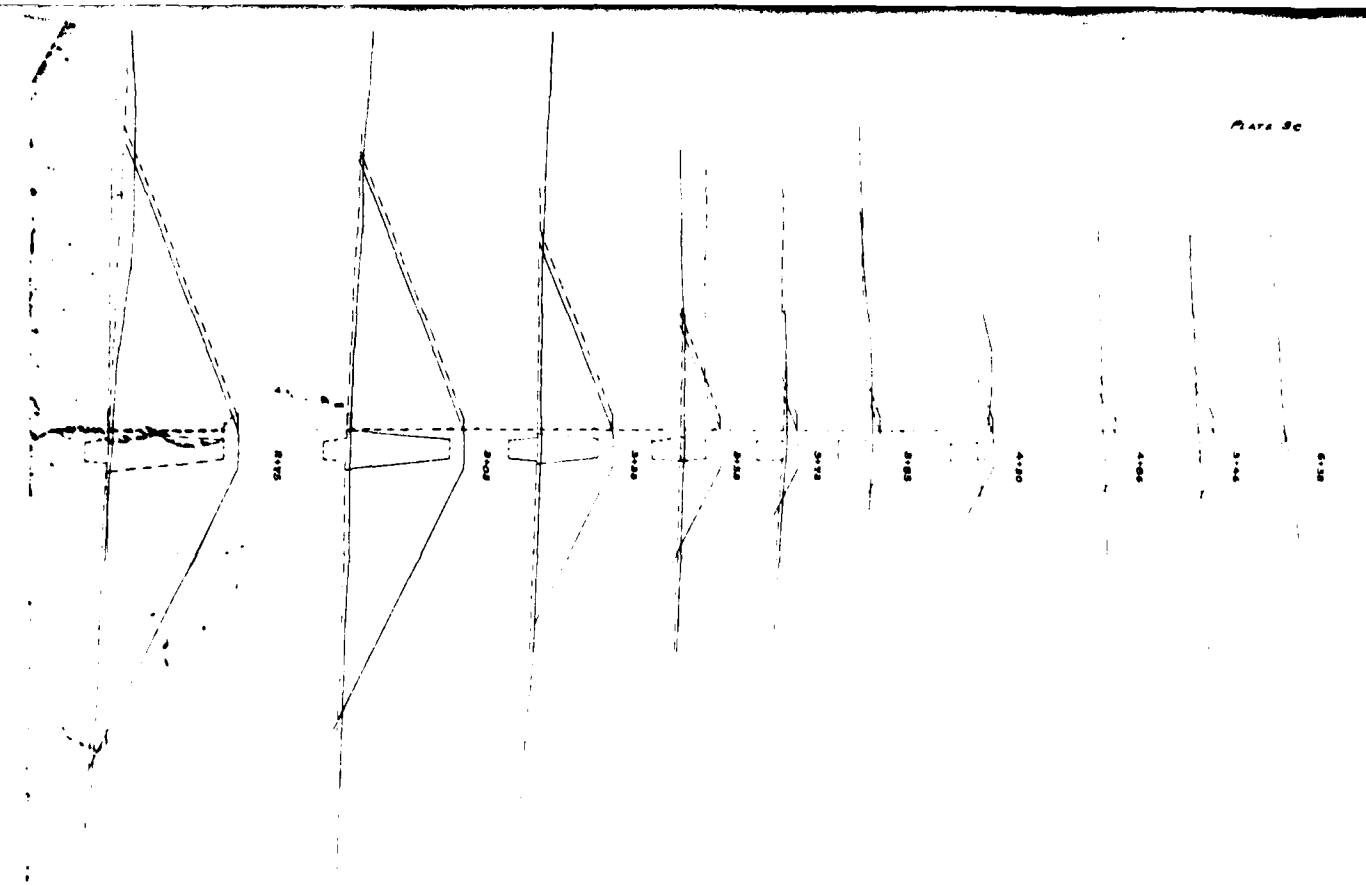
W. S. FRANKLIN, ENG.

1888.

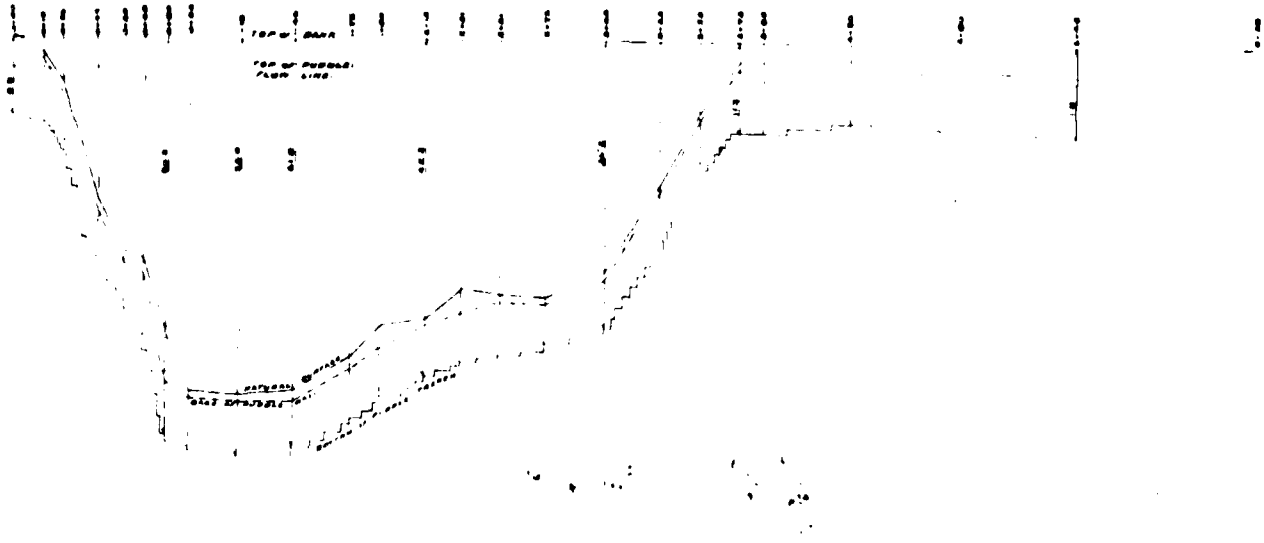


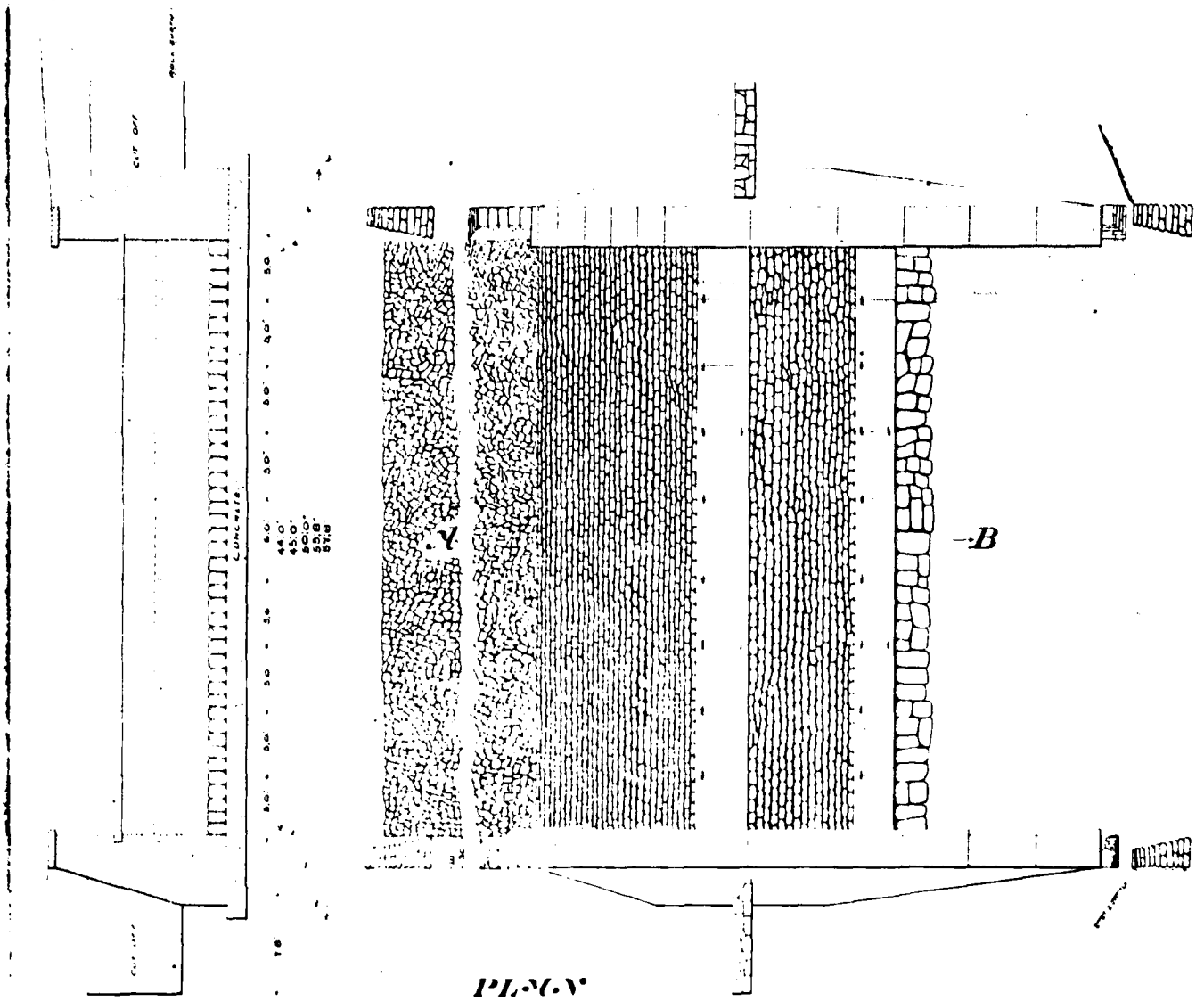
F-1


2+81
2+31
2+10
1+80
1+73
1+46
1+18

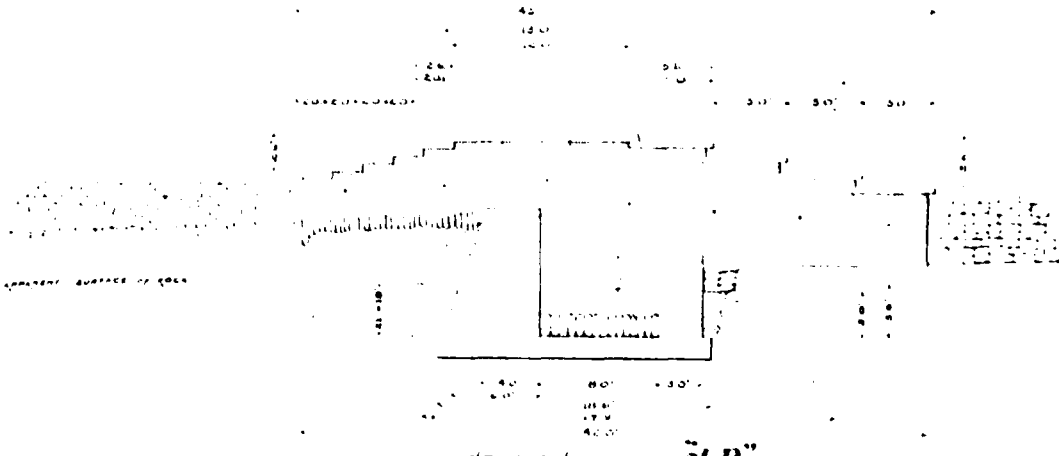


PROFILE





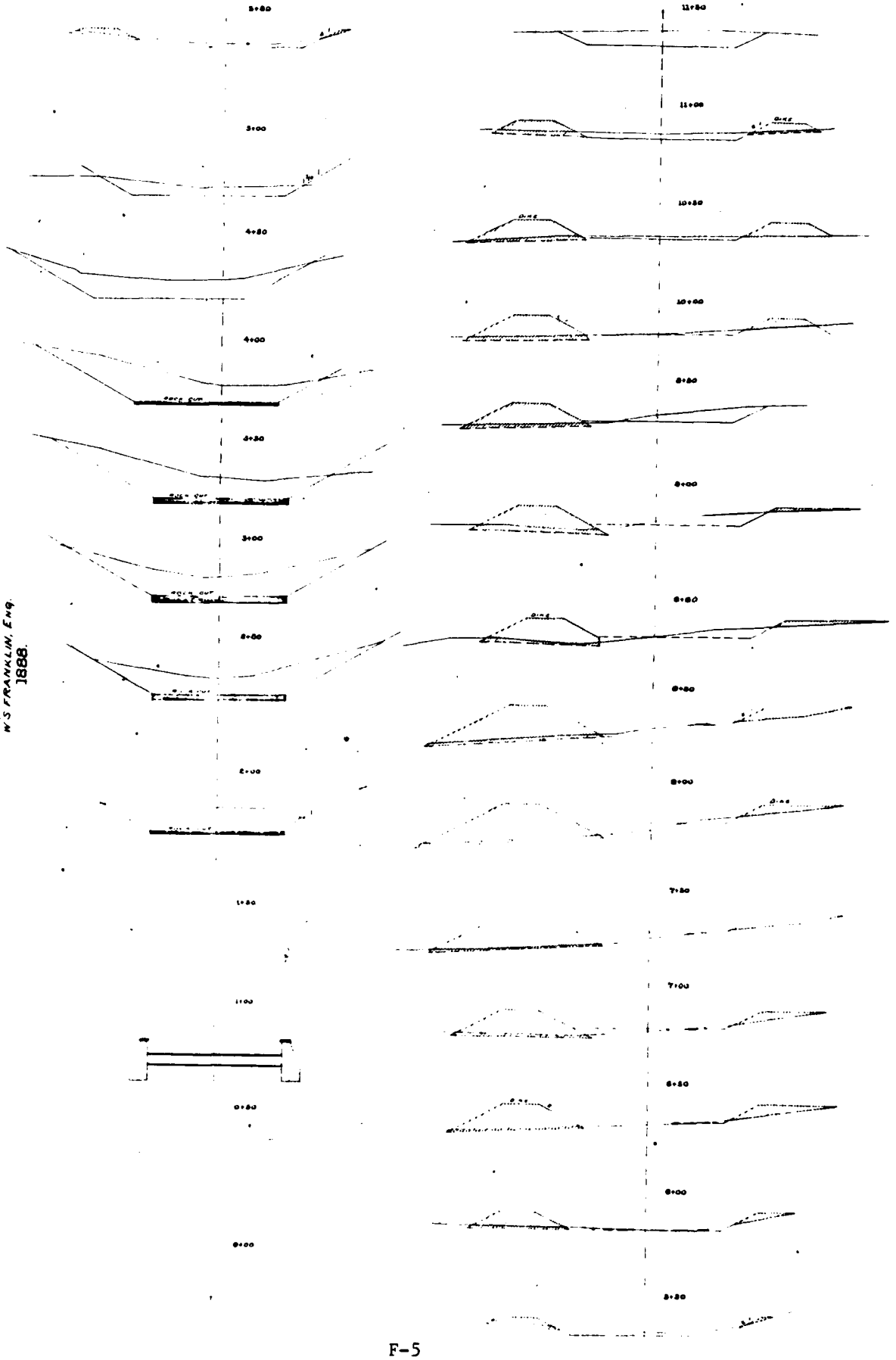
PLAN
OF
WASTE WEIR.
NORWICH WATER WORKS
SCALE 1"
W.S.FRANK, M.V. ENG.
1888

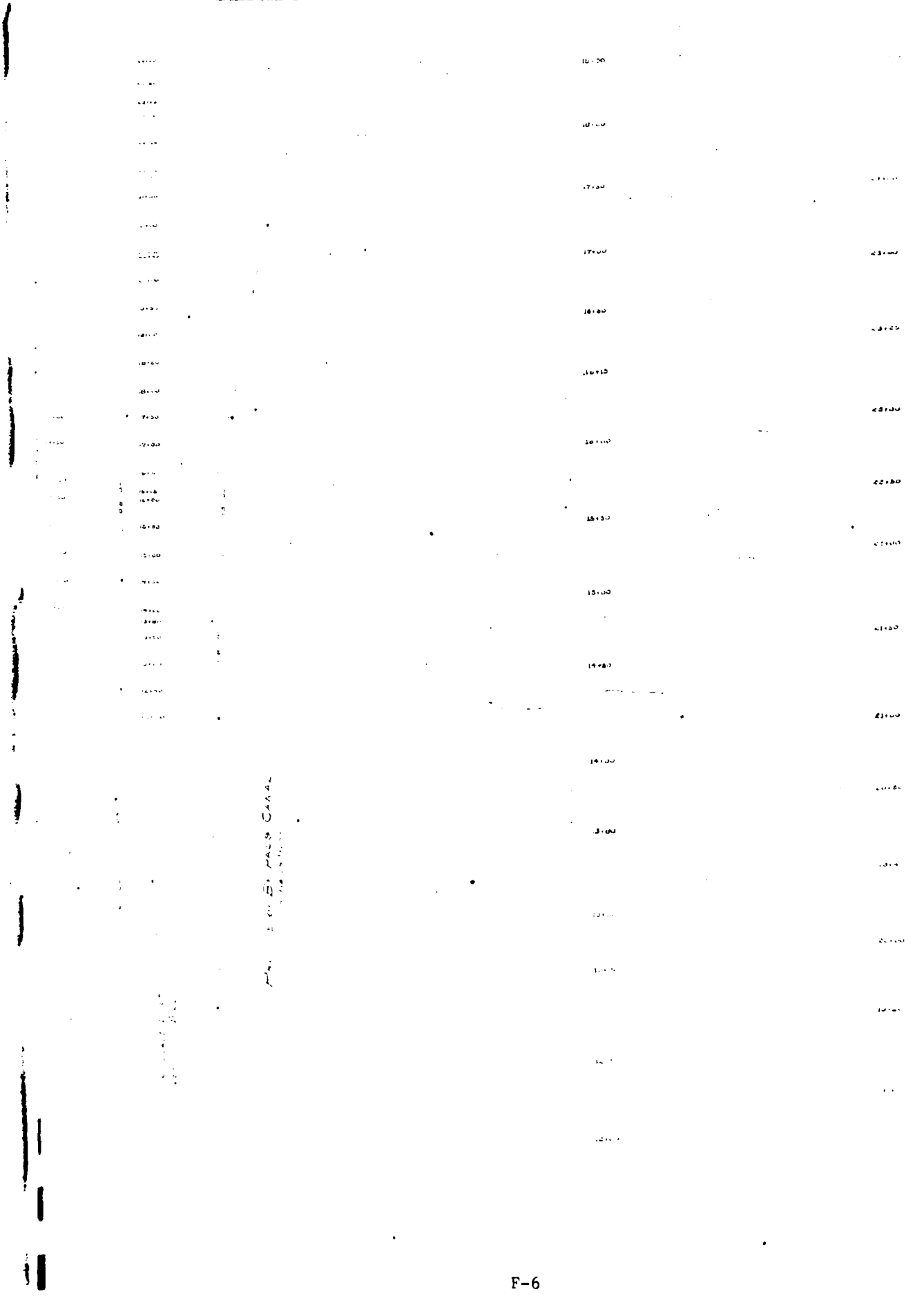


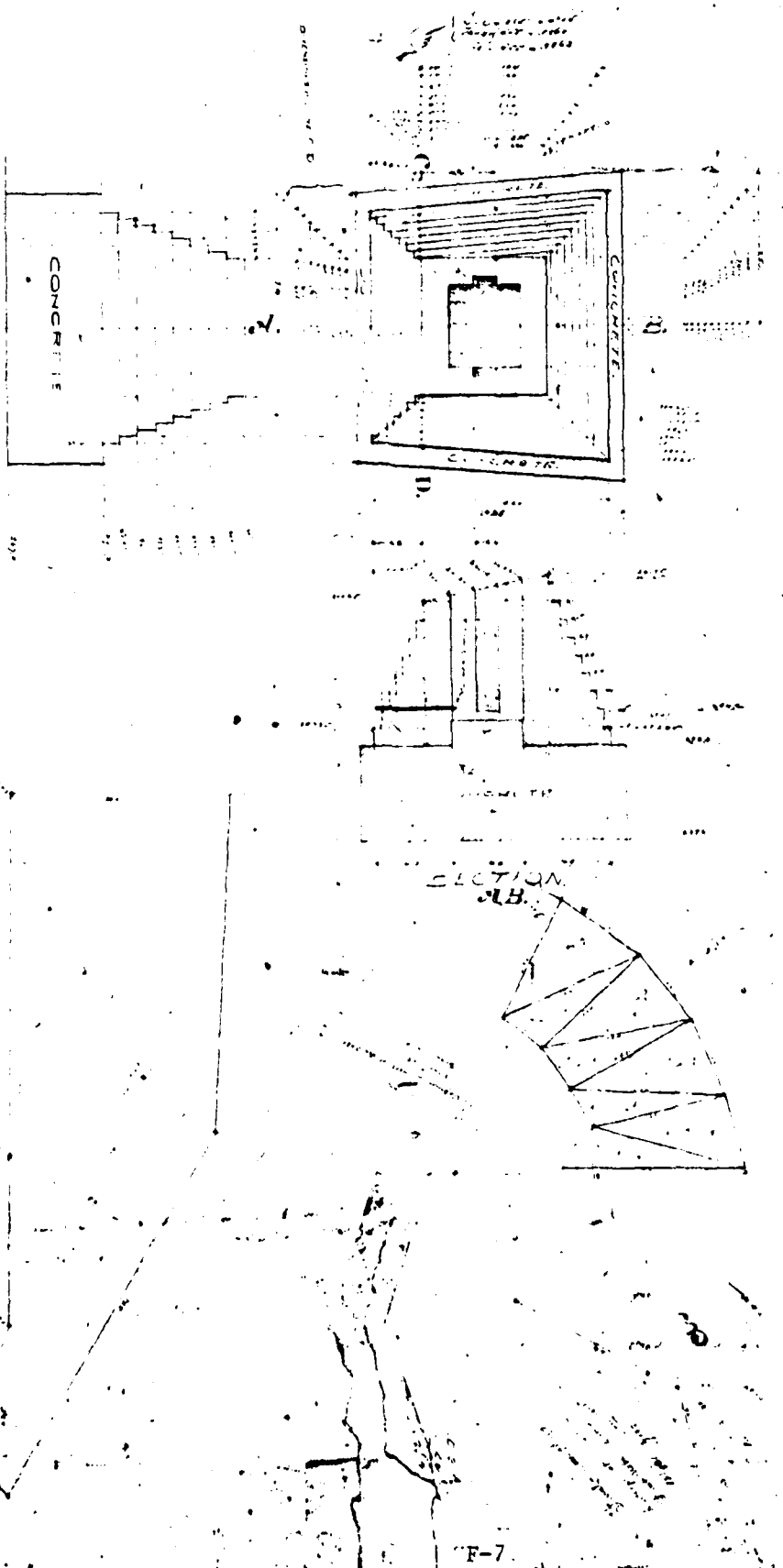
SECTION ON LINE "AB".

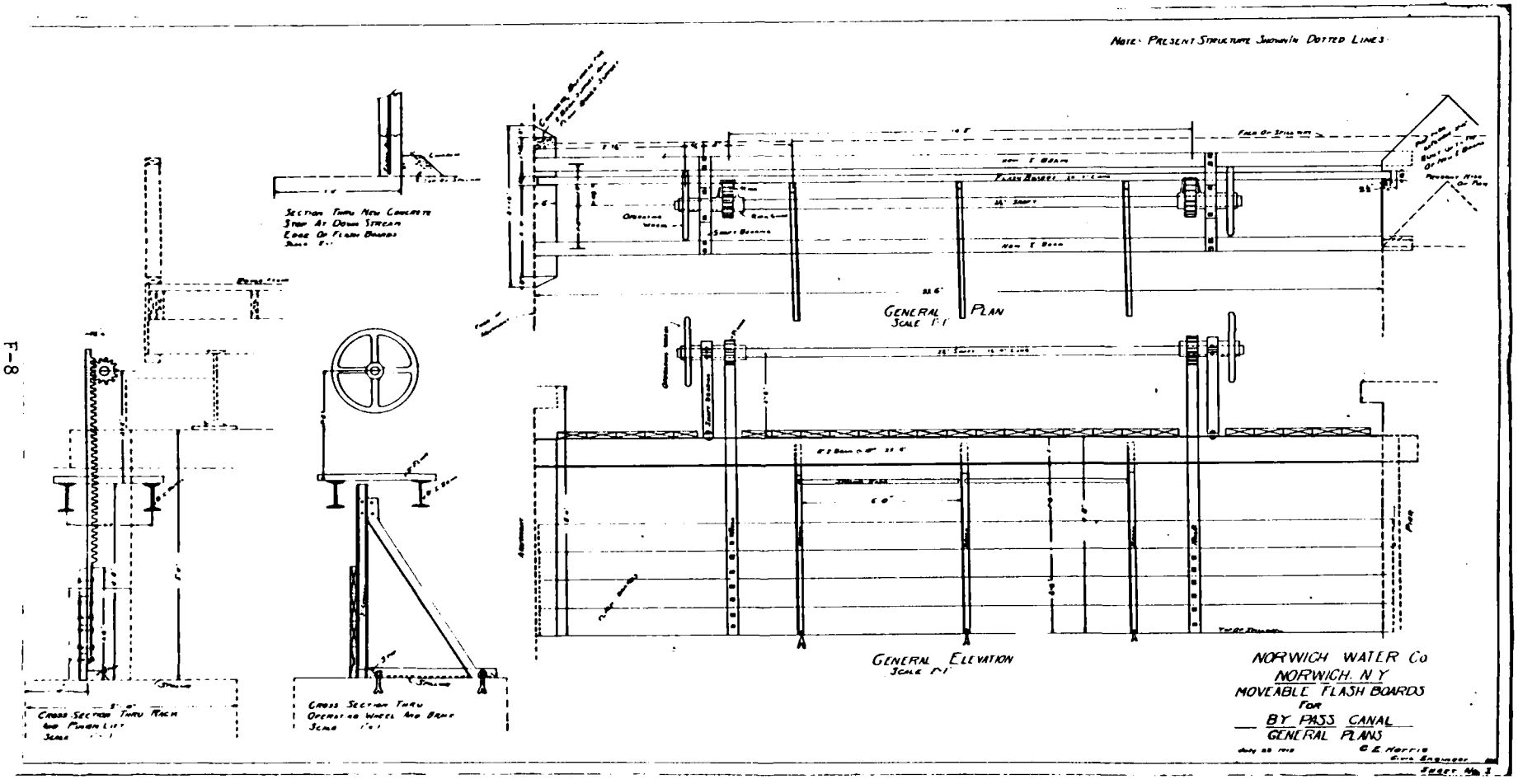
PLATE 8A.

CROSS SECTIONS
OF
BY-PASS CANAL.
NORWICH WATER WORKS.
SCALE 1" = 40'
W.S. FRANKLIN, ENG.
1888.

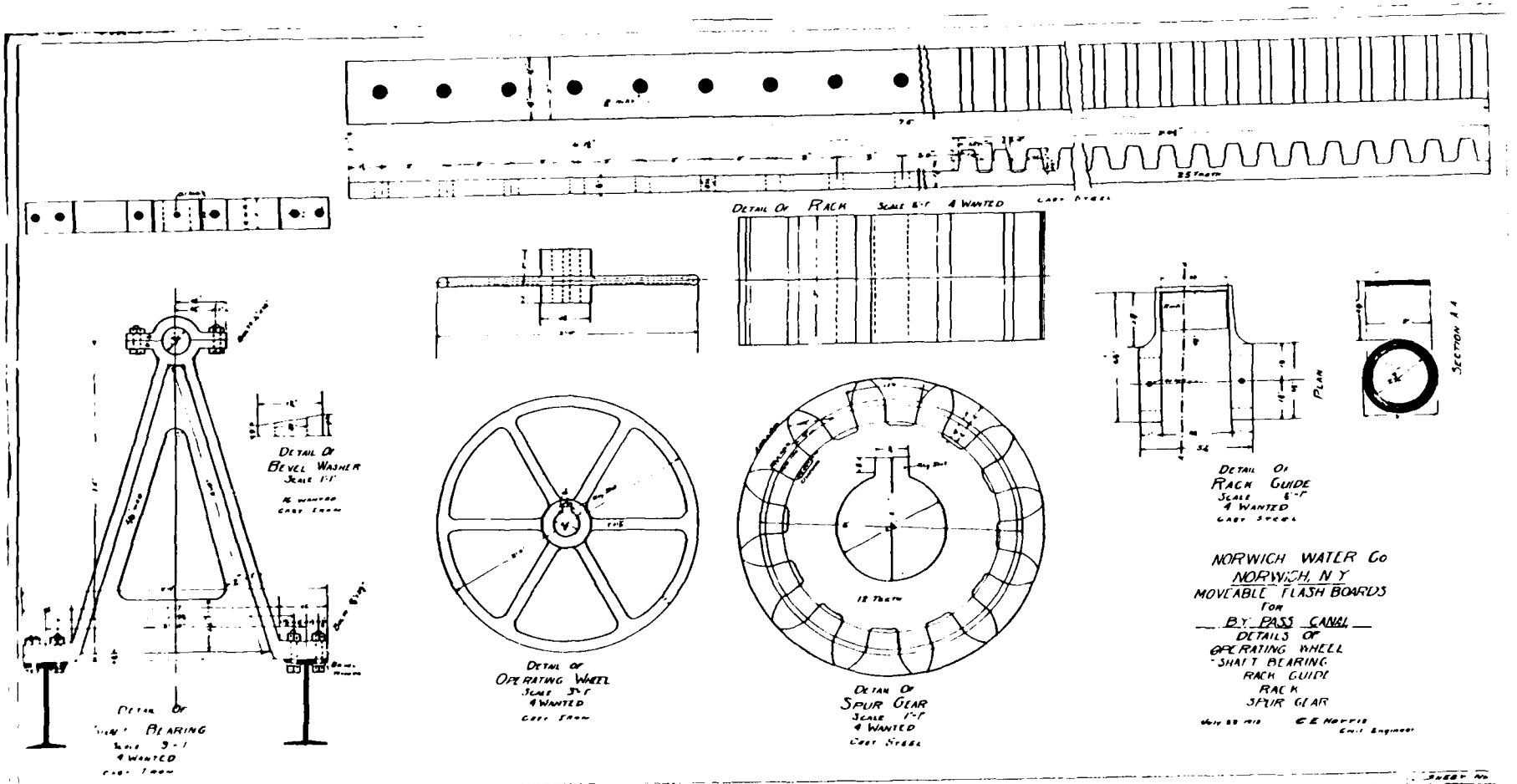




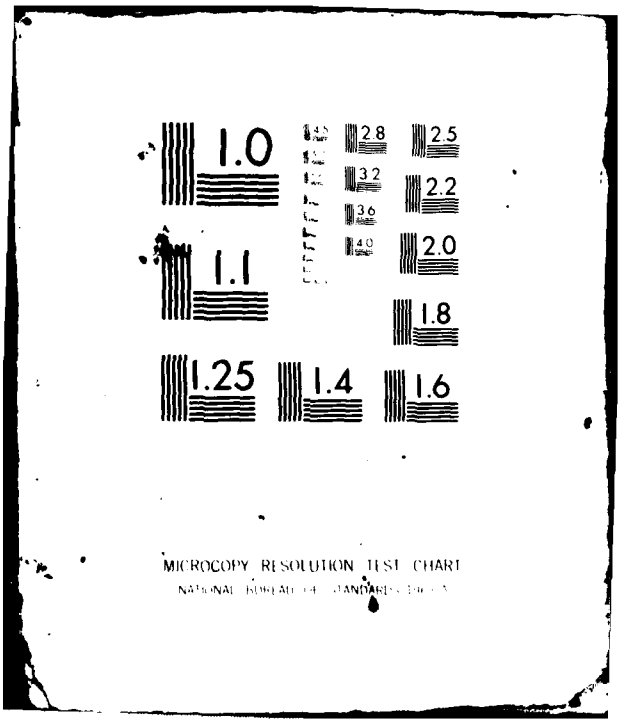

CONCRETE
CONCRETE
CONCRETE
SECTION
AB.

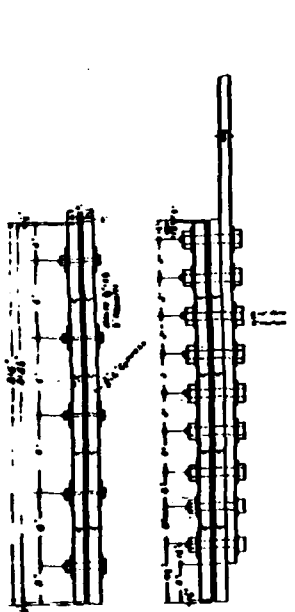

Note: Present Structure Shown in Dotted Lines
General Plan
Scale 1"
General Elevation
Scale 1"
Section From New Concrete Sluice At Down Stream Edge Of Flash Boards
Cross Section Thru Rack and Pinion Lift
Cross Section Thru Operating Wheel And Brake
NORWICH WATER Co
NORWICH. N.Y.
MOVEABLE FLASH BOARDS
FOR
BY PASS CANAL
GENERAL PLANS
G.E. Noffis
Civil Engineer
Sheet No. 1

F-8

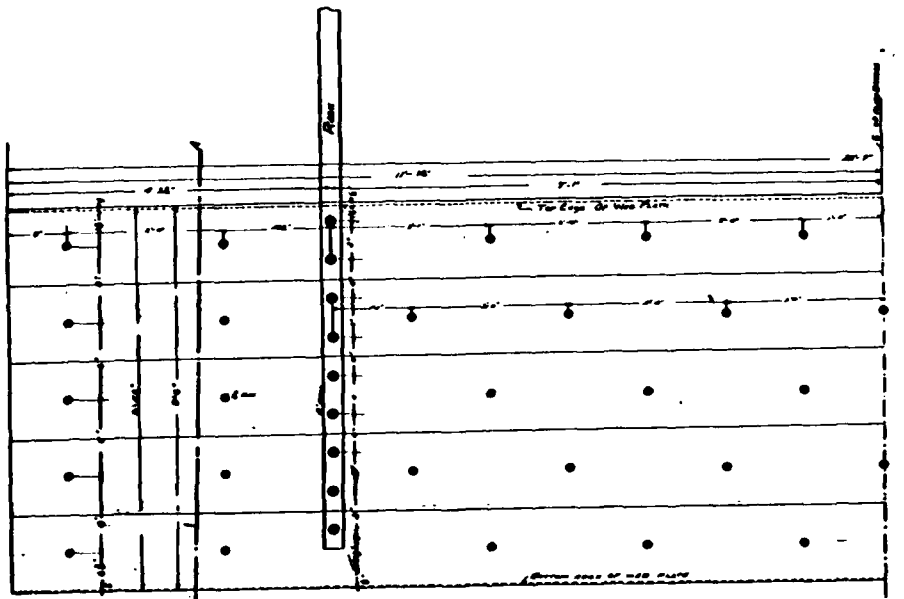

Detail Of Rack Scale 6"=1' 4 Wanted
Detail Of Bevel Washer Scale 1"=1'
Detail Of Operating Wheel Scale 3"=1' 4 Wanted
Detail Of Spur Gear Scale 1"=1' 4 Wanted
Detail Of Rack Guide Scale 6"=1' 4 Wanted
Plan
Section A-A
NORWICH WATER Co
NORWICH, N.Y.
MOVEABLE FLASH BOARDS
FOR
BY PASS CANAL
DETAILS OF
OPERATING WHEEL
SHAFT BEARING
RACK GUIDE
RACK
SPUR GEAR
C.E. Norris
Civil Engineer

AD-A107 414 FLAHERTY-GIAVARA ASSOCIATES NEW HAVEN CT F/G 13/13
NATIONAL DAM SAFETY PROGRAM. NORWICH RESERVOIR NUMBER 2 DAM (IN--ETC(U)
AUG 81 H C FLAHERTY DACW51-81-C-0006
UNCLASSIFIED NL

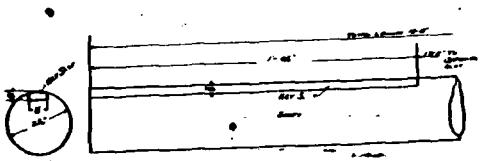

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART



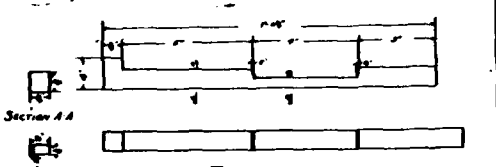
SECTION A-A SECTION THRU RACK



DETAIL OF FLASH BOARDS
SCALE 3"=1'
2 WANTED



DETAIL OF SHAFT
2 WANTED
MACHINERY STEEL



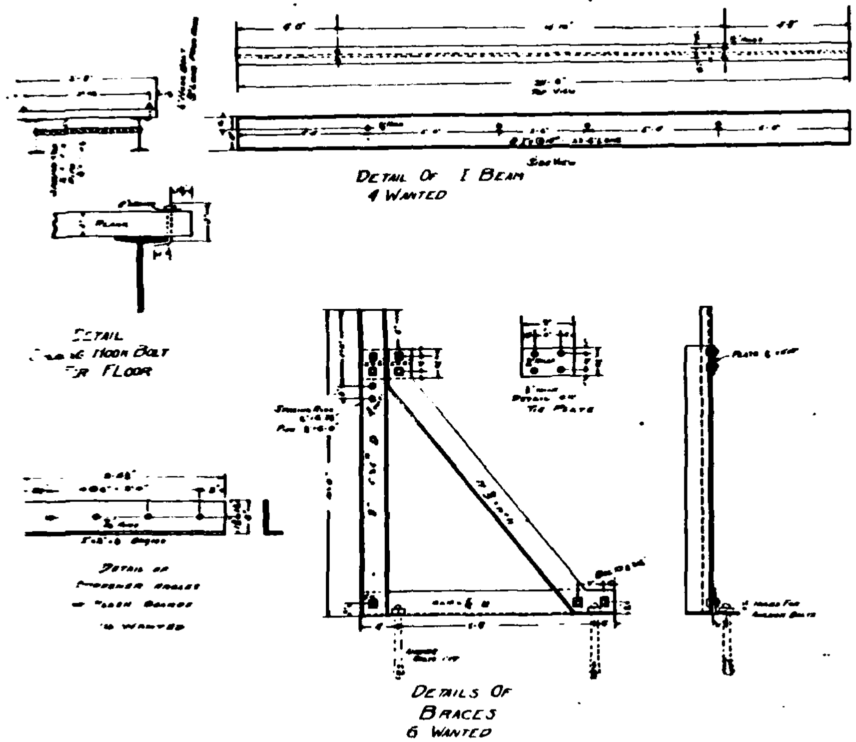
SECTION A-A
SECTION B-B

DETAIL OF SHAFT KEY
4 WANTED
MACHINERY STEEL

NORWICH WATER CO
NORWICH, N.Y.
MOVEABLE FLASH BOARDS
FOR
BY PASS CANAL
DETAILS OF
FLASH BOARDS
SHAFT
KEY

July 22, 1910 W.E. Morris Civil Engineer

SHEET No. 2



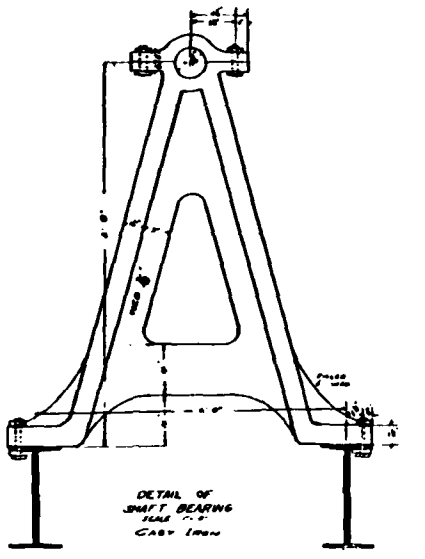
BILL OF MATERIAL			
No	Size	DESCRIPTION	
4	[illegible]	I Beams	[illegible]
2	[illegible]	Shaft	As Per Detail
4		Rack	As Per Detail
4	[illegible]	Spur Gear	As Per Detail
4	[illegible]	Operating Wheel	As Per Detail
4		[illegible]	[illegible]
16	[illegible]	Bolts & Sq Nuts	For [illegible]
8	[illegible]	[illegible]	For [illegible]
16		[illegible]	As Per Detail
4	[illegible]	Key For Shaft	As Per Detail
4		Guard For Rack	As Per Detail
36	[illegible]	Bolts & Sq Nuts	For [illegible]
6	[illegible]	Channel	For Braces
6	[illegible]	Angle	For Braces
6	[illegible]	Angle	For Braces
4	[illegible]	Rods	For [illegible]
4	[illegible]	Pins	For [illegible]
6	[illegible]	Plate	For Braces
[illegible]	[illegible]	Anchor Bolts	For Braces
[illegible]	[illegible]	Bolts & Sq Nuts	For Braces
4	[illegible]	Sleeve Pipe	[illegible]
4	[illegible]	Pins	[illegible]
[illegible]	[illegible]	Hook Bolt	For Floor
[illegible]	[illegible]	Washer	[illegible]
2	[illegible]	Web Plate	For Flash Boards
[illegible]	[illegible]	Bolts & Sq Nuts	For Flash Boards
65	[illegible]	Washers	[illegible]
75	[illegible]	Washers	[illegible]
10	[illegible]	Stiffener Angles	[illegible]
20	[illegible]	[illegible] Cypress	For Flash Boards
40	[illegible]	[illegible]	For Floor on I Beams
[illegible]	Cu Yds	Concrete	In Pier
1	-	-	In Abutment
1	-	-	In Slope

NORWICH WATER Co
NORWICH N.Y.
MOVEABLE FLASH BOARDS
FOR
BY PASS CANAL

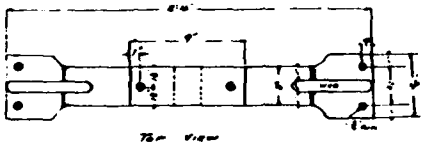
DETAILS OF
I BEAMS
BRACES
AND
BILL OF MATERIAL

July [illegible] 1918 — C. E. Harris, Civil Engineer

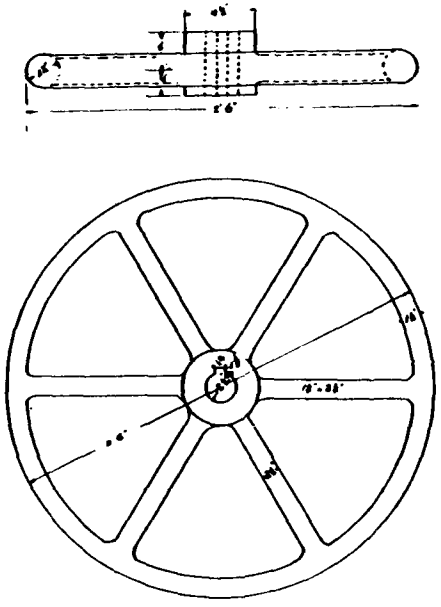
Sheet No. 14



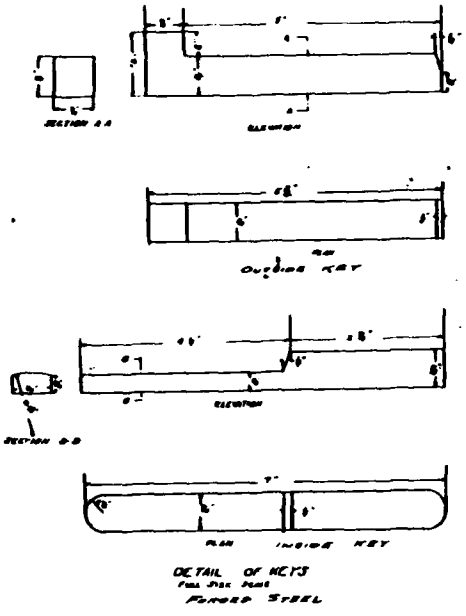
DETAIL OF
SHAFT BEARING
CAST IRON



Top View



DETAIL OF
OPERATING WHEEL
CAST IRON



DETAIL OF KEYS
FORGED STEEL

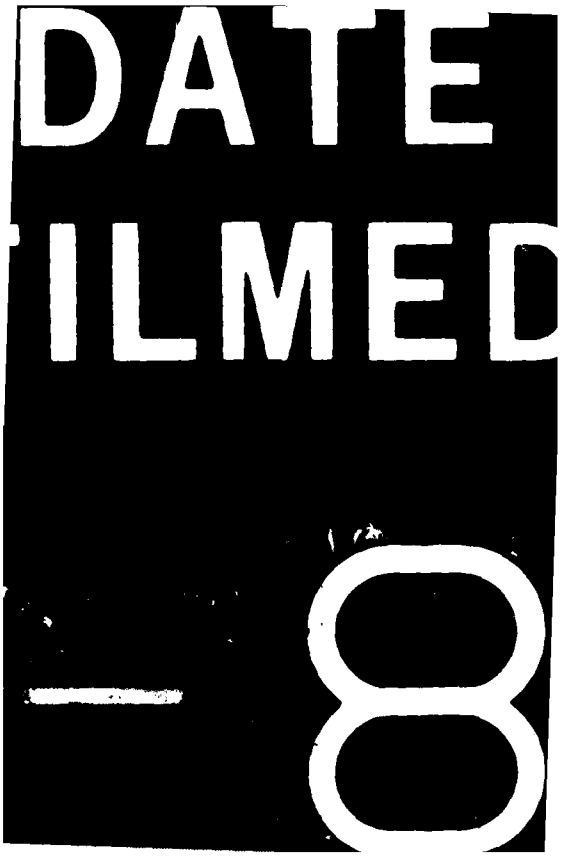
NORWICH WATER Co
NORWICH, N.Y.
MOVEABLE FLASH BOARDS
FOR
BY PASS CANAL
DETAIL OF REPAIRS

July 14, 1914

C. R. HARRIS
Chief Engineer

SHEET No. 5.

F-12


DATE
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8